SCIENTIFIC AMERICAN

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THE CITY OF WORCESTER.

We give an engraving of the magnificent steamer City of Worcester, which has been built by the Harlan and Hollingsworth Company, Wilmington, Del., to ply on Long Island Sound between New York and New London. She is one of the finest specimens of this class of marine construction ever turned out, and as a business boat she has no equal, both as to freight capacity and general arrangement for handling it, while in passenger accommodation she is simply superb in finish and without a peer in this country. She is the largest iron vessel of her special class in the world.

Her register tonnage is 2,485 85-100 tons; length on water line 325 feet, over all 340 feet, moulded beam of hull 46 feet, over guards 80 feet; depth of hold 16·3 feet. The plating is from 7-16 inch to ¾ inch in thickness, the shear streak being 11-16 inch and the inside one 10-16 inch, which being doubled, gives her a thickness of $1\frac{5}{16}$ inches.

She has six water tight bulkheads fitted between double frames on the side, one as a collision bulkhead and one at each end of the machinery space, and the others at regularly intervening distances. Should two of these bulkheads be destroyed by collision, the other four would float the boat.

Her machinery consists of a surface condensing walking beam engine, having a cylinder 90 inches in diameter and 12 feet stroke of piston, arranged with composition valves and seats and Stevens cut off. The wheels are 38 feet in diameter, with buckets of about 11 feet face. She has three main boilers, 37 feet 6 inches long by 12 feet diameter and 13 feet front, containing about 9,300 feet of fire surface and 280 feet of grate surface, and has a certificate for a working pressure of 50 pounds to the square inch. The boat has independent engines and blowers of ample size, which are arranged to blow under the grates. She is also fitted with a 40 horse power donkey boiler, together with steam pump, located on the guard deck and fitted with the necessary attachments and fixtures complete. There are 200 tons of boilers in all, and her main boilers are claimed to be the largest in the world. Her coal bunkers, when full, contain 125 tons of coal.

The forward part of the hull has been extra braced and extra plated, to enable the boat to be safely propelled through ice, with the full power of her engine exerted. The bottom is covered inside with the best quality of Portland cement.

Over a million pounds of iron were expended on her up to the time she was launched (March 12, 1881), and as strength was the first great desideratum it was gained at a small expense upon the original proposed draught of water of the vessel, but all are satisfied that no stronger boat exists to-day. As to her beauty, taken in every detail, there are none to be found who do not pronounce her perfect in this respect. She has 161 selling state rooms, 519 berths, and is licensed to carry 519 first class and 223 deck passengers; a total of 742. The City of Worcester carries eight metallic life boats, six 22 feet long, two 24 feet long, and one wooden 16 feet long, all square sterned; four metallic life rafts, and several of Woolsey's cork life buoys. Every berth in the vessel is provided with Kanhweiler's Neversink cork life jackets, and the same kind of jackets are liberally provided for the deck passengers and crew. In fact she has eight hundred of these valuable and only reliable life preservers on board, all within easy access to the passengers. Every precaution within the range of practical experience has been taken to guard against fire. There are nine fire plug outlets on the main deck, eight in the saloon, four in the hold, and four on the hurricane deck, all supplied from two large pumps, driven by the donkey engine, in which steam will always be kept up for immediate action in case of an emergency. There are 1,450 feet of hose attached to the plugs in convenient positions, to be used for no other purpose whatever.

The boiler space is closed in with iron fireproof deck and bulkheads, making a fireproof section, to guard against any danger of fire from that quarter. So far as we can see nothing has been left undone to make her secure against any character of accident, either by collision, stranding or fire.

Now a word as to her freight capacity, which is greater than any combined two of the other large Sound steamers, as she will easily stow ninety long car loads, and can upon a pinch carry 120 car loads. This fact alone shows how great an improvement has been made in this respect in designing this boat.

A special feature of her internal arrangements consists of a separate gangway for passengers which has been provided on the freight deck, by which they can enter or leave the boat without coming into contact with the incoming and discharging freight and baggage.

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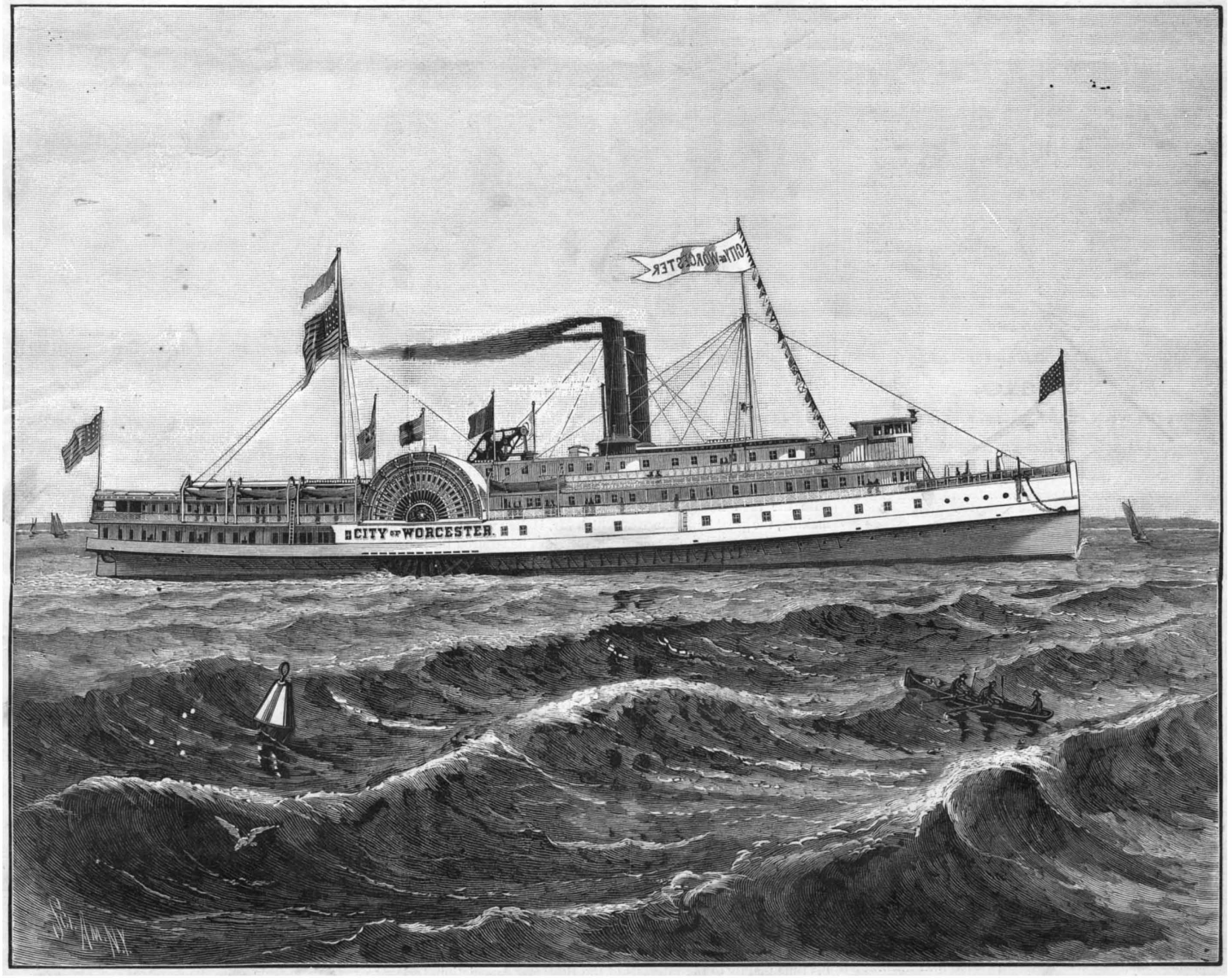

THE NEW PALATIAL IRON STEAMER CITY OF WORCESTER OF THE NORWICH AND NEW YORK TRANSPORTATION COMPANY.

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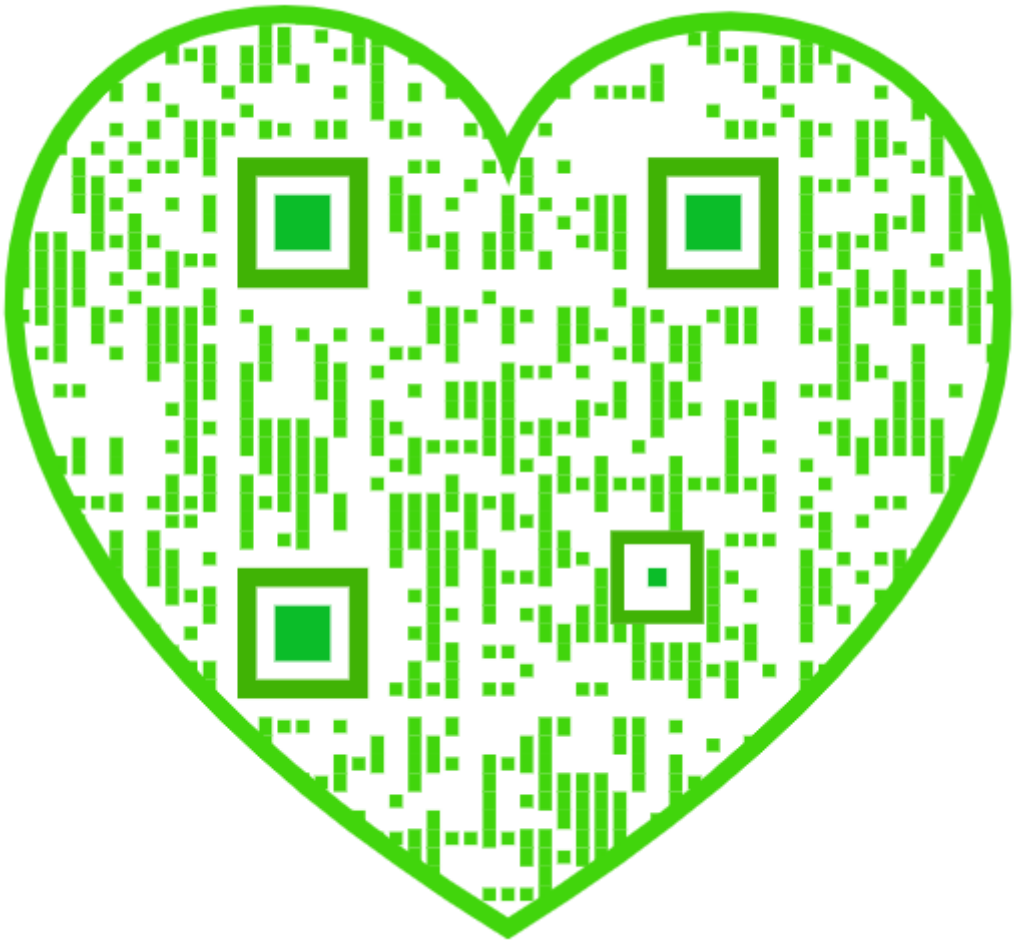

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NEW YORK, SATURDAY, FEBRUARY 11, 1882.

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ALEXANDER LYMAN HOLLEY.

In the death of Alexander L. Holley, in Brooklyn, N. Y., January 29, the country loses one of its best known mechanical engineers and writers upon engineering subjects, and the world one of its foremost men of affairs.

Mr. Holley was born in Lakeville, Conn., January 20, 1832. His early taste for mechanics led him to spend some time as a boy working at the machinist's trade. In college he took the scientific course, graduating at Brown University, Providence, R. I., in 1853. From college he passed to the machine shop of Corliss & Nightingale, in Providence, now the Corliss Steam Engine Works, where he served in the double capacity of workman and student. Subsequently he spent some months as locomotive engineer on the Stonington and Providence Railroad, and then entered the New York Locomotive Works as draughtsman. About this time he began the contributions to technical journals which have since been so numerous and valuable. In 1856 he bought the *Railway Advocate* (founded by Zerah Colburn), and shortly after he went to Europe to study the working of the railway systems there. One of the fruits of these studies was the valuable report on American and European railways brought out by him in connection with Mr. Colburn. While abroad at this time Mr. Holley expressed in letters to the New York *Times* the notable prediction that screw propulsion was destined to supersede side wheels for ocean navigation. He returned on the first voyage of the Great Eastern to this country. In 1860 was published his book on "Railway Practice," which added materially to his standing in this department of engineering.

In the capacity of consulting engineer in the construction

ALEXANDER LYMAN HOLLEY.

of the famous Stevens Battery, he became greatly interested in ordnance and armor, and accordingly revisited England in 1862 to study the latest improvements in marine warfare. The immediate results of these studies was the "Treatise on Ordnance and Armor," which was promptly accepted on both sides of the ocean as a standard authority. A collateral and more important result of this visit was an acquaintance with the then newly developed Bessemer process of steel making, the great importance of which Mr. Holley was quick to appreciate. With characteristic foresight he secured the control of the American patents of Mr. Bessemer, forming for their development the firm of Griswold, Winslow & Holley, whose experimental plant, at Troy, N. Y., was the pioneer establishment of the sort in America, the success of which was largely due to improvements introduced by Mr. Holley. This enterprise was followed in 1867 by the establishment of the Pennsylvania Steel Works, near Harrisburg, Pa., plans for which were furnished by Mr. Holley, who had for some time personal charge of the works. Other works of this class built by Mr. Holley, or under his supervision as consulting engineer, were those of the North Chicago Rolling Mill Company, the Joliet (Ill.) Iron and Steel Company, The Bethlehem (Pa.) Iron Company, The Edgar Thomson Steel Company, near Pittsburg; the Lackawanna Iron and Coal Company, Scranton, Pa.; and the Vulcan Iron Company, St. Louis, Mo. The improvements in the Bessemer plant and processes introduced by Mr. Holley in these works were many and valuable. After the last named works were constructed Mr. Holley turned his attention to the open hearth process for steel making, and designed the plants for the Cambria Iron Company, the Springfield (Ill.) Iron Company, and the Spaug Steel and Iron Company, of Pittsburg, Pa. For the past two years Mr. Holley has devoted his time mainly to the interests of the Bessemer Association, studying the adaptation of the basic process to the Bessemer plant.

Notwithstanding these severe and laborious engagements, Mr. Holley made time to aid in many ways his fellow laborers in the several departments of engineering progress. He was a prominent and active member of the American Society of Civil Engineers, the Iron and Steel Institute of Great Britain, the American Institution of Mining Engineers, and the American Society of Mechanical Engineers, and had served as presiding officer of each of the American Associations. He also served for some time as a member of the United States Government Board for testing the strength of metals, as trustee of the Rensselaer Polytechnic Institution, at Troy, N. Y., and as lecturer at the School of Mines, Columbia College.

Personally Mr. Holley was of the finest temper and amiability of disposition, genial, witty, and kindly to the highest degree. For the excellent portrait herewith, and for many facts with regard to Mr. Holley's life and labors, we are indebted to the courtesy of the *American Machinist*.

SOME QUESTIONS OF COAST DEFENSE.

Every year, in their annual reports, our military and naval authorities dwell with more or less of emphasis upon the exposure of our coastwise cities to attack, in case of war, and our manifest lack of guns, forts, and ships for their defense. Every year the questions involved are more or less earnestly discussed in Congress and in the newspapers; and every year goes by without seeing any positive movement toward providing a remedy for the undesirable state of things which all parties pretend to deplore.

The difficulty would seem to lie not in any lack of popular interest, in or out of Washington, but in a positive and general lack of agreement as to what ought to be done. The naval authorities naturally urge the building of more and better ships, and the construction of powerful guns for their armament. Given the ships and guns, backed by proper shore batteries and torpedoes for the inner lines of defense, and, they say substantially, the security of our popular and wealthy seaports will be assured. The military authorities as naturally call for the strengthening and more efficient arming of the forts about our harbors, floating batteries and torpedo systems being regarded as entirely subsidiary. The torpedo service is disposed to consider forts and ships in the light of means for more securely and effectually operating torpedoes, which, after all, should be the main reliance. But neither arm of the service appears able to convince Congress or the people that any device or combination of devices now developed is quite sufficient to meet all the requirements of this case.

The conditions of coast defense for this country are peculiar in comparison with those obtaining in Europe. The breadth of sea between us and any other first-class nation is so great that no permanent invasion of our shores need be feared. And as we have no colonies to defend, no allies to champion, no foreign commerce to protect, we have no need of a navy for aggressive uses. Could we use a navy economically in coast defense?

The curvature of our Atlantic coast, which chiefly needs defending, is such that a hostile fleet rendezvoused at the Bermudas, would be within three or four days' striking distance from either of our Atlantic seaports, from Portland to St. Augustine. And the longest time that would elapse between the discovery of the destination of a threatening fleet would be too short to allow of any concentration of naval forces to withstand the attack. To defend our entire coast by ships would, therefore, require, at each and all of ten or more ports, ships and guns enough to repel the largest fleet that could be brought against such port. Obviously a purely naval defense of such an enormous stretch of coasts would be neither practicable nor economical.

It would be possible to erect and arm at points commanding the entrances to our harbors ironclad forts amply capable of repelling any fleet that might try to enter is beyond question. In conjunction with channel torpedoes it would not be a hard thing to keep the most powerful of war vessels from forcing the harbor. But the sealing up of a harbor's entrances would not in all cases be coincident with the protection of the port and the city within.

For instance, a modern ironclad armed with the most powerful of existing guns could greatly injure, perhaps entirely destroy, New York city and Brooklyn without coming near enough to a shore battery, however placed, to be in serious danger from guns of equal power to those of the ironclad. There are guns that will throw shot and shell from eight to twelve miles. But the same guns would not penetrate the armor of an ironclad (allowing that they could hit it) at anything like that range.

Those of our coast cities that lie from ten to twelve or more miles from the sea may be protected by properly placed land fortifications, properly armed and armored. But New York and Brooklyn are not so situated. Forts and torpedo systems for the channels to the harbor might successfully guard these cities against capture; but they would be powerless to save them from grievous harm at the hands of a determined enemy.

The question of defense for New York resolves itself, accordingly, to this: How can we keep an ironclad or a fleet

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of them from coming within range? We must go out to the enemy and destroy him, or drive him away. Such service may be performed:

1. By heavily-armored floating batteries, carrying the most powerful guns.
2. By swift and powerful rams.
3. By torpedo boats capable of being operated in rough water and at a great distance from the shore.
4. By small, swift vessels, armed with the heaviest guns.
5. By torpedo-missiles thrown through the air.

To meet great ironclads with great ironclads would seem to be an extremely expensive and hazardous proceeding, even if competent vessels of this sort were in possession and could pass in and out over the outer channel bars. The utility of rams is beyond question—provided they are swift and staunch and easily handled. Such rams are yet to be built. Small and swift gunboats, each carrying one gun of the highest attainable efficiency, might do the work. But this type of vessels, also, is yet to be developed. Great things are promised under the Lay torpedo combination; but as yet the torpedo for open sea use is practically unknown. The use of torpedo missiles to be launched through the air is as yet a mere suggestion. Shells charged with gunpowder are destructive only when they have buried themselves in the target. The more sudden and powerful explosives act differently and far more destructively. It is now possible to charge a torpedo with two non-explosive substances, a liquid and a solid, which become powerfully explosive when mixed. Would it be possible to charge projectiles with these substances? Until the two were combined the shell would be as safe to handle as a solid shot. In the act of firing or during the transit of the shell through the bore of the gun the gas pressure upon the base of the projectile might be made to crush the cell containing the liquid; the mixture of the ingredients would be effected during the flight of the projectile, and the originally inert charge converted into an explosive as powerful as dynamite, which, by well-known means, might be fired by the impact of the shell on striking. In this case the damage would not be measured by the penetrative power of the gun, but by the disruptive power of the torpedo-projectile. With such projectiles war ships might be kept from coming within miles of shore by simple and comparatively inexpensive land batteries.

Another line of development in torpedo warfare would seem to be possible in the direction of submerged or nearly submerged small torpedo craft, to be operated by one or two men, yet capable of planting against the side or bottom of an ironclad torpedoes of sufficient force to sink any vessel, however well armored. These small craft might win by sheer force of numbers, while the hazard of life would be reduced to the smallest.

In most of the discussions of this question it is tacitly assumed that defense must be sought by the conventional means of military and naval warfare; that we have little choice but to copy the processes and appliances upon which so much money has been spent in Europe. A wiser way would be to assume that the old means are substantially antiquated, except for use along the inner lines of defense, and to offer to inventors such inducements in the way of provisions for testing their novel devices as would encourage the boldest development of new ideas. The problem of coast defense is a serious one; and the hope of the country of safety in the emergency of war hangs upon invention, bold and radical invention, not in costly appliances in the way of ships, forts, and the like, whose day of possible usefulness usually passes before they can be made ready for actual service.

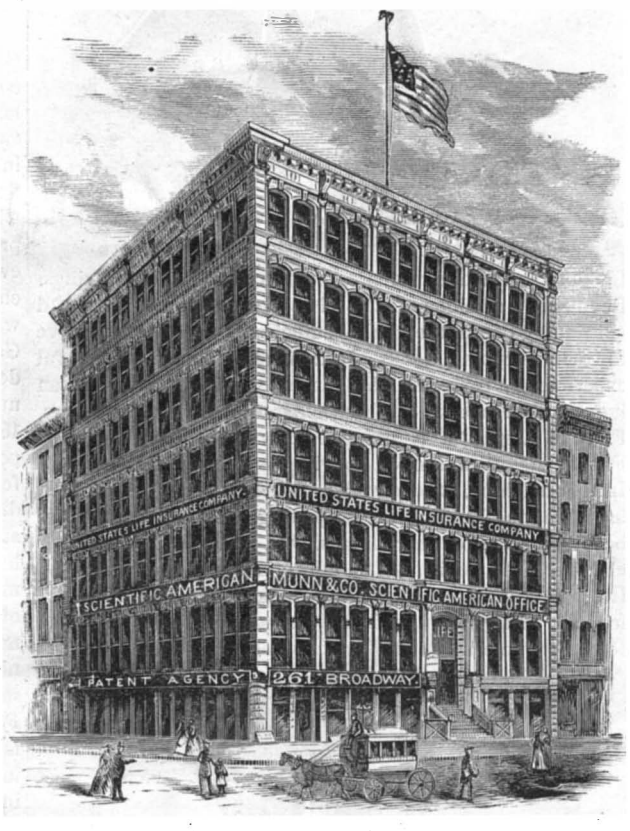
THE OLD SCIENTIFIC AMERICAN OFFICE, 37 PARK ROW, NEW YORK. DESTROYED BY FIRE, JANUARY 31, 1882.

BURNING OF THE OLD AND OPENING OF THE NEW SCIENTIFIC AMERICAN OFFICES, NEW YORK.

A business residence of some twenty-five years in the old quarters, No. 37 Park Row, New York, had rendered us almost oblivious to the fact that ours was not a fireproof dwelling with modern improvements. We were rudely aroused from a fancied security on the morning of January 31, at 10 o'clock, by a sudden alarm of fire. The cry was "Run for your lives!" and of the forty or fifty persons forming our corps of assistants, all, except half a dozen or so, rushed for the stairways, and, happily, gained the street in safety. The few who tarried, perhaps three seconds, were cut off from the stairs by the flames; these were Mr. Cyrus L. Topliff, of our financial department; Mr. B. G. Underwood, of our advertising department; Mr. Henry E. Mead and Mr. F. L. Seitz, of our art department; Mr. W. M. Avery and Mr. Harrold Avery, of our engraving department; Mr. C. N. Tillottson, of our subscription and mailing department, Mr. Charles Sedgwick, of our record department, and Mrs. Markey, janitress of our office. We are under obligations to them for their efforts to save property. They were taken from the third story windows by the gallant firemen who rapidly put up the ladders and rescued not only our people, but scores of others from the windows adjacent and above our premises. The splendid and effective services of the firemen on this occasion merit the highest praise, and show the excellence of their organization.

To the exertions of Mr. Topliff, of our financial department, whose coolness and presence of mind were conspicuous, we are much indebted. For him and Mr. Tillottson the alarm meant the instant gathering and placing of our records, subscription books, drawings, and correspondence, in the large fireproof safes provided for that purpose, and the locking of the safe doors.

The fire spread with such amazing rapidity that in fifteen minutes the great building was in flames from top to bottom. It had three fronts: Park Row, Beekman Street, and Nassau Street. Our establishment occupied most of the entire third floor, nearly two hundred feet long and fifty wide. We give an engraving showing our establishment as it appeared before the fire. The reader will be able to picture for himself, better than we can describe, the thrilling spectacle that was presented when the building was wrapped in flames.



THE NEW SCIENTIFIC AMERICAN OFFICE, 261 BROADWAY, CORNER WARREN STREET, NEW YORK.

There was a leaden sky; a snowstorm was in progress; great volumes of smoke and fire belched from the windows; groups of helpless men were seen clinging here and there to the window sills, calling for help; the streets below were filled with hurrying firemen and horses, hissing steamers, ladder and hose carts, stand pipes and fire paraphernalia of all kinds. In the background of the City Hall Park were fifty thousand spectators, whose cheers of joy made the welkin ring when the ladders went up and the rescue was complete.

Several hundred persons were in the building, but all escaped, it is thought, except seven, who, sad to relate, lost their lives, two by jumping, through fright, from the windows before the ladders arrived. The others, it is believed, were overwhelmed by the gas and smoke. Three of the lost were employed in the office of the New York *Observer*, which adjoined our own office. From the fourth story window above us a young woman of 17 years, Miss Green, leaped to the pavement, and was caught and saved in a tarpaulin, held by Mr. O. F. Gunz, Theo. Hoster, and H. L. Goodwin, of the SCIENTIFIC AMERICAN office, and others. She says she was told to jump, and did so, became instantly unconscious, and knew nothing of the result until she recovered her senses in a neighboring store.

The fire was caused, it is supposed, by the overheating of a chimney, which set fire to woodwork of the lowest floor, and, once started, it ran up the elevator shaft with almost lightning velocity. It was an old-fashioned building, floors, beams, and mazes of partitions, all pine, of quarter of a century dryness. No wonder that it burned quickly. In half an hour the walls fell in and the old SCIENTIFIC AMERICAN office was in ruins.

Two hours later we had leased the elegant series of offices in the large building of the United States Life Insurance Company, 261 Broadway, corner of Warren, across the Park, opposite our former quarters; and before nightfall loads of desks, chairs, drawing tables, books, and instruments had been delivered, our helpers were at work, and the hum of the SCIENTIFIC AMERICAN beehive had again begun.

The late fire makes no interruption in our business. Our printing and mailing was all done in another building; all our plates were preserved, and the regular issues of the SCIENTIFIC AMERICAN and SUPPLEMENT proceed as usual. Nearly all of our books, records, correspondence, and patent drawings were preserved. The principal loss was in furniture and back numbers of our publications. The latter are being rapidly reprinted from the plates. Some hundreds of old models, and a few new ones, are in ashes. But this is of little account, as the Patent Office does not now require models except in special cases.

Hardly had we taken possession of our new quarters when we began to receive letters and telegrams from hundreds of friends. The *American Machinist* most promptly and generously offered us the use of all their types and engravings. We have gladly availed ourselves of this kindness in making use of the excellent portrait of the late Mr. Holley, engraved specially for the *Machinist*, together with the excellent biographical sketch written by our contemporary. To the proprietors of the *American Machinist*, the *Mechanical News*, the *Mechanical Engineer*, *Science*, the New York *Times*, the *World*, the *Independent*, *Engineering News*, and other papers, we return our sincere thanks for their kind offers of printing and other facilities. We also gratefully acknowledge the kind invitation of Mr. Thomas D. Stetson and Mr. David L. Haight, of the Vanderbilt Building, to occupy their offices temporarily; and the proffers of aid from Messrs. Brown & Brown, from Elihu Root, Esq., and many others.

Our good fortune in so quickly finding suitable shelter from the snow storm rendered it unnecessary for us to take advantage of these kind offers; but we appreciate all the same the generous spirit that prompted our friends, and we shall remember them with gratitude.

We are asked, in view of this calamity, what we consider to be the best protection against fire. We say a good fireproof building. The New York *Times* edifice, which adjoined the burned structure, is built with iron beams and brick arches, and suffered no damage except some water.

We are also asked as to the best fire escape. We say a stout chain, long enough to reach the ground, and attached ready for use within every separate apartment of the building.

We are also asked as to the best fireproof safes. We say Marvin's, 266 Broadway. In them were saved the SCIENTIFIC AMERICAN drawings, books, and records, from this great fire. On the morning of the second day our books were in use. But more of safes hereafter.

Our new offices at 261 Broadway are unequaled for excellence and convenience of location. We give herewith an engraving of the new building. It is located near the general Post Office, opposite the City Hall Park, and in front of the entrance to the great suspension bridge between New York and Brook.

THE BRANCH OFFICE OF THE SCIENTIFIC AMERICAN, CORNER F AND 7TH STREETS, WASHINGTON, D. C.

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lyn. If any of our readers wish to gaze upon a scene of active city life we advise them to come and stand for a few minutes upon the steps of the new SCIENTIFIC AMERICAN office. The throng of passengers and vehicles constantly moving before our doors is remarkable.

We cannot very well close this little episode relating to the SCIENTIFIC AMERICAN offices without giving our readers a picture of our branch office at Washington. It is located at the corner of F and Seventh streets, directly opposite the Patent Office, a location which, by its convenience, greatly facilitates us in the dispatch of our affairs. In this and our New York establishment, aided by many able assistants, we are carrying on probably the largest and most successful business relating to patents that was ever undertaken by a single firm. We aim to do the work promptly, properly, and on moderate terms. That our labors, which now extend over a continuous period of more than thirty-five years, are highly satisfactory to the public, is seen in the wide patronage that we enjoy, and which steadily increases with each passing year.

IT is gratifying to know that Commissioner E. M. Marble has been prevailed upon to reconsider his proffered resignation of the Commissionership of Patents.

Manufacture of Oxygen Gas.

The industrial manufacture of oxygen has engaged much thought, while the uses, on a large scale, of that agent have not been very exactly determined. At Passy, says *Nature*, there are now works for producing the gas according to an improved method of MM. Brin frères, who attach the highest value to oxygen as an industrial agent, and indicate various applications of it. The process is the well known one in which caustic baryta absorbs oxygen from the air, and gives it up under heat. By a special way of preparing the baryta, however (described in *Annales Industrielles*), they render it highly retentive of its absorbent power, obviating the necessity of frequent renewal. After 400 operations there was (on microscopical examination) no appreciable change. The baryta is placed, at Passy, in metallic retorts connected, in groups of fifteen, in two furnaces heated with gaseous fuel. A locomotive engine drives Root blowers, which force air into the retorts; after peroxidation the oxygen is liberated by heat, and pumped into the gasometer through an apparatus which removes traces of carbonic acid. As it is found that the peroxidation takes place better with moist than with dry air, the air is passed through a saturator on its way to the retorts. For production of 5,000 cubic meters of oxygen a day in Paris, it is estimated (from the data at Passy) that the cost per cubic meter would be from 0·12 to 0·15 franc, according as coal or coke was used for fuel. The price of 100 kilogrammes of baryta prepared by the new method is about 250 francs.

Wild Beasts and Snakes in India.

It is with somewhat more than ordinary interest that we have for some years past awaited the annual records setting forth the fearful ravages wrought by tigers and other wild animals, and by snakes, throughout our Indian empire. From a brief notice which appears in the columns of a contemporary, we now learn that there has been a steady *decrease*, from 1876 to 1880, in the total number of wild animals destroyed throughout Hindostan, coupled, however, with a proportionate *increase* in the number of persons killed by wild animals and snakes. Thus, whereas in the year first named there were destroyed in Hindostan no fewer than 23,459 wild beasts, in 1880 the figures diminished to 14,886; but, during this same period, the number of human beings who have lost their lives has mounted up from 19,272 to 21,990! One satisfactory feature observable in the present annual returns is that relating to the great increase in the number of snakes destroyed in the Bombay Presidency alone. Of course, it must be a matter of impossibility to suggest an antidote for the mortal injuries inflicted by a wild beast such as the tiger; but there would seem to be a good field now presented for the further prosecution of the experiments already made by Dr. De Lacerda in connection with a specific for snake bite.

Consolidation of Torpedo Interests.

The various patentees of electrical devices for torpedoes have lately combined in one corporation, to be known as the Lay Torpedo Company. By combining all the recent improvements in devices for reducing the size, increasing the speed, and controlling the discharge of movable torpedoes, it is believed that torpedo boats can be built at once smaller, lighter, and faster than any before seen; boats that can be run on or below the surface, as may be desired; steered in any direction, and stopped at will; exploded by the operator or automatically, as may be desired, the charge being 100 pounds of explosive equal to dynamite in power. One wire will carry the current for stopping, starting, steering, or firing.

Electricity from Crystals.

Jacques and Curie have shown that by the mere compression of an inclined hemihedral crystal, electricity is developed. They experimented by placing a crystal or a suitable section of it between two sheets of tin foil insulated on the exterior by plates of caoutchouc, the tin foil being connected to a galvanometer. By now compressing the crystal in a vise or otherwise, electricity is developed and may be measured by the galvanometer. The electricity developed is the opposite of that produced by heating a crystal—that is to say, the extremity of the crystal which becomes positive on heating, becomes negative on compression. On releasing the pressure, electricity of an opposite kind is produced. The authors find that the production of electricity by pressure can only be obtained with hemihedral crystals having inclined faces. By combining a number of such crystals in a pile, they have invented a new apparatus for producing electricity. The amount of electricity developed varies for different minerals. They find, for example, that a section of quartz, cut perpendicular to the main axis, evolves more electricity than a similar section of tourmaline.

IMPROVED PULVERIZER.

A very simple and effective pulverizing machine has lately been perfected by Messrs. Thomas B. Jordan & Son,

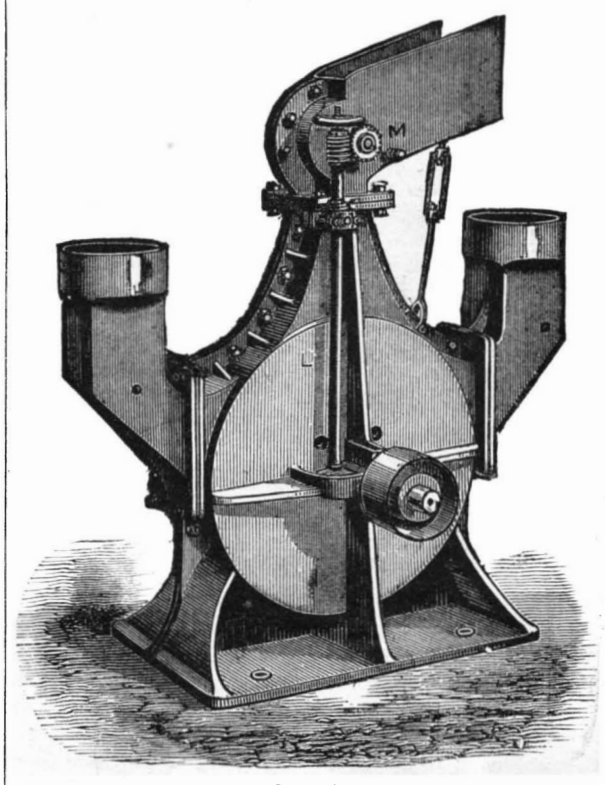

FIG. 1.
IMPROVED PULVERIZER.

London, and which is represented in the two engravings. Requiring a machine of this class for their own use, and not finding one in the market sufficiently simple or effective for their purpose, Messrs. Jordan, after long and careful experiments, perfected this machine, which constitutes an important advance in crushing apparatus. In our engravings, Fig. 1 is a general perspective view of the machine; while Fig. 2 is a vertical section showing its internal arrangement. In this machine, two circular dished castings, A A, each having a long bearing, B, projecting from its center, are bolted together by their flanges, C C, and form the crushing chamber, D D, which has an inlet opening on the top, E, and two outlet openings, one on each side, F F. The two bearings carry short wrought iron spindles at B, which meet end to end at the center of the crushing chamber. On the inner

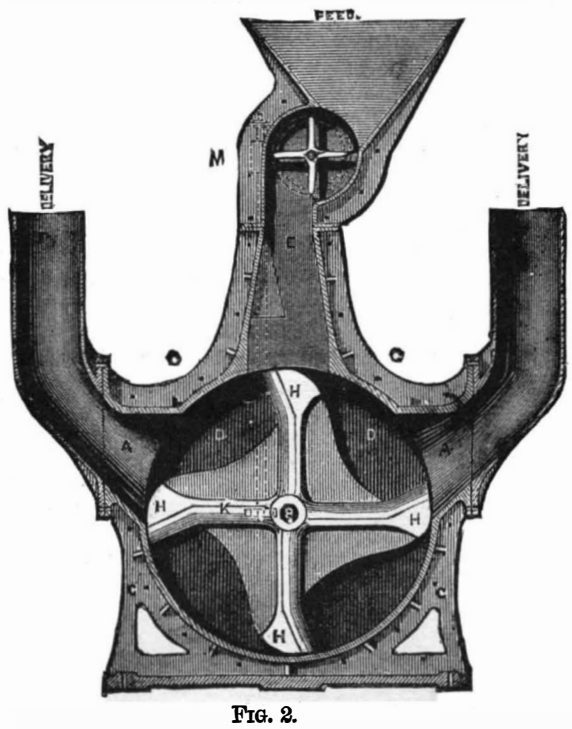

FIG. 2.
IMPROVED PULVERIZER.

side of each spindle is keyed a set of four arms, H H H H, of the diameter of the chamber, the surfaces of the one set of arms being so angled at 45 degrees with the horizontal center line that they are parallel to and face those of the other set. These arms revolve in opposite directions, passing close to each other and to the sides of the chamber, and their backs are so formed as to create a blowing or fan action in the chamber, drawing air through openings placed in the sides and near the center of the chamber. On the outer end of the spindles, at B, are keyed pulleys for driving by belts, the spindles and their arms and pulleys being quite free and independent of each other to turn in reverse directions. One of the spindles at K, has a worm engaging a wheel, and working the vertical shaft, L, which drives at a given speed the automatic feeder, M. By means of driving belts on the pulleys the spindles and their arms are revolved in reverse directions at any suitable speed for the material to be crushed. The material falling into the chamber from the automatic feeder is struck by one of the arms (owing to the angle of its face) into the path of those revolving in the reverse direction, and is by them, for the same reason, immediately returned; thus it is with great force struck to and fro from arm to arm until reduced as fine as required. There is, therefore, no grinding action, the crushing being done entirely by percussion or impact, but without centrifugal force. This is the whole process of crushing. The fineness of the material leaving the machine is regulated not by sieves in the ordinary way, but by the current of air, which immediately carries off all particles light enough for its force to suspend, and the force of this current can be accurately adjusted by closing or opening the apertures in the casing. The current in the machine is sufficient to carry the crushed material up 10 or 20 feet of pipe to another chamber, the height of which column of pipes also regulating the size of the particles delivered, different sizes being delivered at various levels if required. It will thus be seen that the machine is extremely simple; complete in itself and self-contained; there is very slight wear and tear; and great saving of power, there being no grinding action or friction between the parts of the machine, and the crushed material leaving the machine immediately in the state required, giving place to fresh crude stuff. Although very recently introduced, several of these machines are already in use in a cement factory, where they are doing good work. Being applicable to the reduction of any kind of material to the finest possible powder without sieving, this pulverizer undoubtedly has a large future before it.

The Cola Nut.

Sir Joseph Hooker's recently issued report on Kew Gardens contains an interesting note on the subject of the cola nut. They are the seeds of a tree, *Cola acuminata*, belonging to the natural order Sterculiaceæ. From six to twelve are contained in woody pods, from three inches to six inches in length, of which five or less are produced by each flower. Like olives, they are said to enhance the flavor of whatever is eaten after them. But their most important property is that they are said to have the power of staying, even for a prolonged period, the cravings of hunger, and of enabling those who eat them to endure prolonged labor without fatigue. In a report by Consul Berkeley, from the Gambia, some interesting facts relating to the large trade done in them in West Africa are given. The import of these nuts was, in 1879, no less than 108,000 pounds more than in 1878; while, on the other hand, the exports were also 58,000 pounds in excess. The trade in cola nuts is an attractive feature in the commerce of the Gambia. They are the product of the Sierra Leone district, and the trade in them, both at Sierra Leone and the Gambia, is almost exclusively in the hands of women, to a large number of whom it affords the means of livelihood, and in many instances the acquisition of considerable wealth. They are largely consumed by the natives of the Gambia, and are of bitter taste and produce no exhilarating effect, but are said to possess the power of satisfying for a considerable time the cravings of hunger. For this purpose, however, the nut is much less used than it is as a luxury. The trade in the article is rapidly increasing. In the year 1860 the import was about 150,000 pounds; in 1870 it had increased to about 416,000 pounds; while in 1879 it had increased to over 743,000 pounds. During the past ten years, also, the trade has spread to Central African, and even to the African shores of the Mediterranean. It is pointed out by Sir Joseph Hooker that the *Cola acuminata*, in fact, plays the same part in tropical Africa that Erythroxylon coca does in South America. The plant has been introduced into the West Indies, and it having been suggested that the nuts would be valued in the Indian Ocean, the plant has been successfully propagated at Kew, and thence has been distributed to the Botanic Gardens at Calcutta, Cambridge (United States of America), Ceylon, Demerara, Dominica, Mauritius, Sydney, and Zanzibar.—*London Times.*

The Waukegan Artesian Well.

Waukegan, Illinois, is in latitude 42° 30′ N., longitude 88° W., on a bluff 80 feet above and overlooking Lake Michigan. Settled in 1834, it was incorporated as a city in 1859. A water supply is procured from an artesian well, completed in 1875 to a depth of 1,134 feet. Rock is encountered 180 feet from the surface, to which depth the boring is cased with a four-inch iron pipe. The first pipe put in corroded and was replaced in 1881.

The water will rise to 65 feet above the surface. The well discharges into a brick tank 20 feet square and 20 feet high, built half above and half below the surface of the ground, on the highest land in the city. The supply is copious and constant.

From the tank it is distributed by cast iron pipe, of which three miles, mostly of six inch diameter, are laid, with fifteen fire hydrants.

The population in 1880 was 4,031. The daily consumption is not stated. The yield of the well is in excess of the present demand. The cost of the well was $3,350.

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MISCELLANEOUS INVENTIONS.

Mr. Louis C. Lugmayr, of Water Valley, Miss., has patented an improved valve-operating mechanism. The object of this invention is to work the valves of steam engines for cutting off with one eccentric, and also allow reversal of the engine with the same mechanism. The invention consists in a slide block connected with the eccentric and valve rod and carried by a guide pivoted to swing for shifting the valve.

An improved sewing machine work-basket has been patented by Mr. Joseph Le Roy Parkinson, of Cambria, Wis. The device is attached to machines already made, which have side drawers and a side plate or brace, for giving the board additiona support and strength. In new machines there is a brace cast upon one of the legs of the machine for supporting the wing to which the basket is attached.

Drop-light chandeliers have been constructed with a central drop-light; but with this construction the central parts of the chandelier are scorched and defaced by the heat rising from the central drop-light. Mr. John Trigge, of New York city, has patented an improved drop light chandelier in which this defect is avoided.

Mr. Nicholas B. Dennys, of Singapore, Straits Settlements, has patented a violin, which, though plainly audible to the player, cannot be heard at a short distance, thus enabling amateurs and learners to practice without inconvenience to others.

Mr. William H. Metcalf, of Brooklyn, N. Y., has patented a process of treating hide in the manufac ture of counter-stiffeners. The object of this invention is to render hide counters waterproof, so that they shall retain their rigidity under all circumstances. The process consists in saturating with a solution of benzine, paraffine, and drying oil.

An improvement in breech-loading firearms has been patented by Mr. Henry Scott, of Birmingham, England. This invention has reference to breech-loading small arms of the kind commonly called "drop down guns;" and the invention consists in the combination of parts for cocking the concealed or internal hammers of the guns, and in the arrangement of the parts of safety apparatus for preventing the accidental discharge of the guns.

Mr. Edwin E. Glaskin, of Lower Cape, N. B., Canada, has patented an improved fire-kindling block composed of 5 parts sawdust, 1 part resin, and $\frac{1}{16}$ part oil mixed together and densely compacted, so that the block is hard and non-friable.

Mr. Albert Berryhill, of Pittsburg, Pa., has patented an improved nut lock, which consists of two grooved blocks held in a longitudinal slot of a plate placed on the bolts and over a recessed plate, which in turn is placed against the fish-plate or against a plate resting against the fish-plate, which blocks are held against the nuts to prevent them from turning by a locking wedge placed between them and into the recess of the recessed plate, parts of the slotted plate being bent outward to form an aperture to admit the locking wedge.

A NEW ELECTRIC MOTOR AND ITS APPLICATIONS.

M. Trouvé recently addressed to the Academie des Sciences a note relative to the improvements made in coils of the nature of those of Siemens. We give herewith figures of this new motor based on these improvements To show the reader the idea that M. Trouvé has followed up in order to arrive at his results, we reproduce the following passage from his note to the Academie:

"When we trace the dynamic diagram of a Siemens coil, on causing the latter to make one complete revolution between the two magnetic poles which are reacting upon it, we observe that the work is almost null during two quite extended periods of its rotation. These two periods correspond to the time during which the cylindrical poles of the coil, having reached the poles of the magnet, are passing before them. During these two fractions of the revolution (which are each about 30°) the magnetic surfaces designed to react on each other remain at the same distance, and the coil is not then incited to revolve. The result is a notable loss of work. I have gotten rid of these two periods of indifference and increased the useful effects of the machine, by modifying the polar faces, so that instead of being portions of a cylinder whose axis coincides with the old system, they are snail-shaped, and thus in revolving gradually bring their surfaces near those of the magnet up to the moment at which the posterior edge *escapes* the pole of the latter. The repelling action then begins, and a dead center is thus avoided."

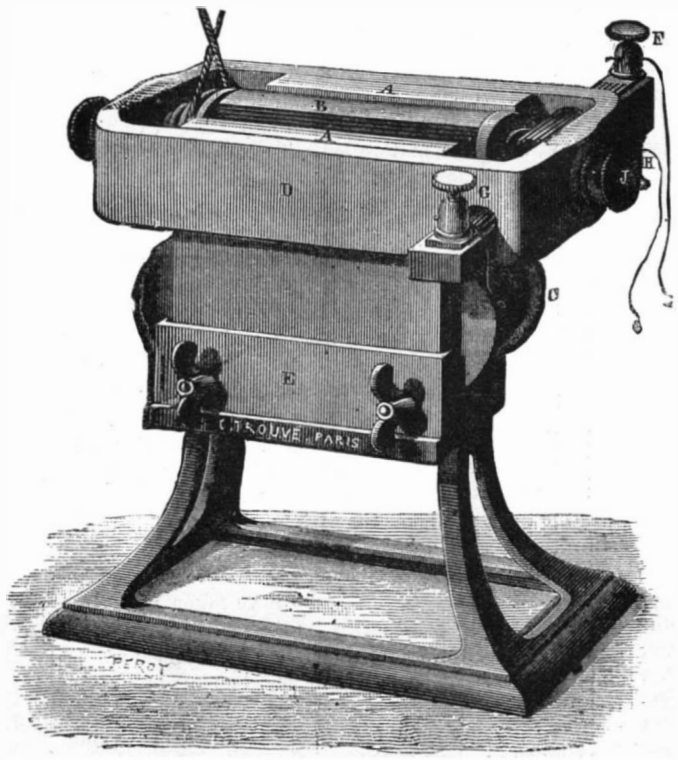

Fig. 1.—TROUVE'S NEW ELECTRIC MOTOR.

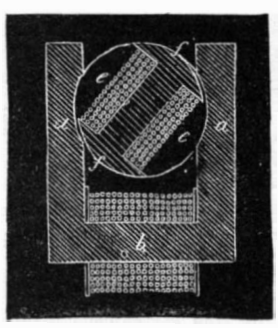

Fig. 2.

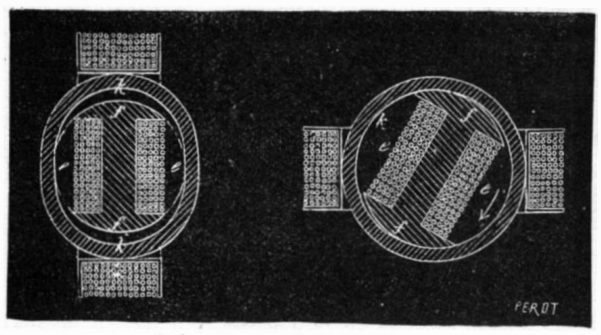

Fig. 4.

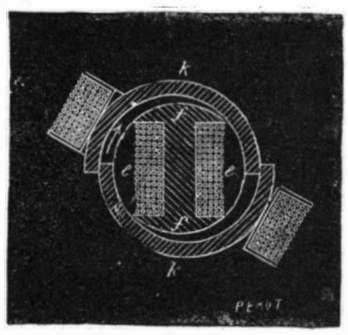

Fig. 5.

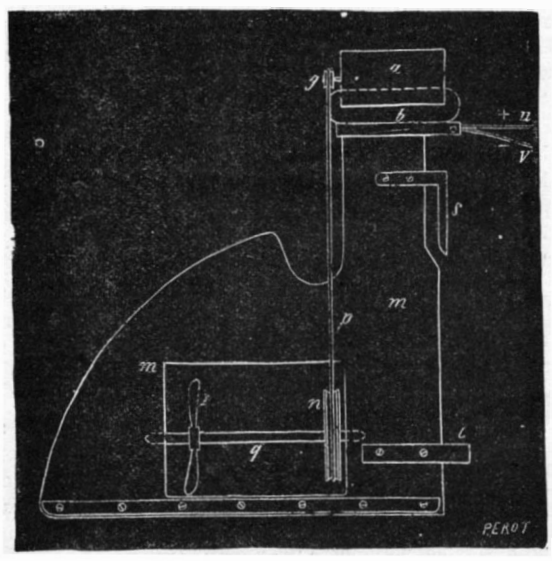

Fig. 6.

Fig. 1 gives a perspective view, one-half actual size, of a motor constructed on these principles, and Fig. 2 gives a vertical section with a horizontal projection of it. The motor is capable of driving a sewing machine with a Bunsen or Reynier pile of a few elements. The prominent features possessed by this new motor may be summarized as follows: (1.) Although of very small size, it has a relatively great power. (2.) The electro-magnetic effects are utilized under the best possible conditions for available work, since the inductor is very close to the armature, which almost completely incloses it (Fig. 2). (3.) The suppression of dead centers with a single movable electro-magnet is complete—a thing of rare occurrence in mechanics, and which would have had an immense influence had it beenapplied to the steam engine instead of to the electric motor. (4.) The direct reaction on each other of two magnets placed in the same circuit allows the power to be indefinitely increased with that of the current employed—this power having for a limit only the resistance of the parts to breakage. (5.) The motor will run with great velocity—even up to two hundred revolutions and beyond per second. (6.) No spark forms at the commutator, the current being never broken. (7.) The motor is reversible, and may, by slight modification, be employed to generate electricity. (8.) Finally, it is moderately cheap. Figs. 3, 4, and 5 are variations of the motor in which M. Trouve has arrived at satisfactory results by making in some cases the inductor, and in others the armature, eccentric. Fig. 6 shows the application of the motor (Fig. 1) to the propulsion of small boats. The arrangement is so simple that it requires even no change in the construction of the boat. The rudder bears within itself all the mechanical elements—motor, propeller, and conductors—and forms a movable unity. The screw and its axle occupy the lower part of the rudder in an aperture made for this purpose, and is actuated by the motor (which is located at the top of the rudder) through the medium of a belt or cord. The electro-motive power furnished by the generator, which is placed in the boat, is transmitted to the generator by means of flexible metallic cords. The rudder is fitted to the boat in the usual manner. In case it be desired to use oars only for propelling the boat, the screw, being no longer actuated by the motor, becomes free, and revolves in the opposite direction. For the last few months M. Trouve has been making numerous experiments with his motor on the Seine with an 18-foot yawl boat used for hunting waterfowl. The game, being no longer frightened by sound of oars, was easily approached. At the very first, the speed of this yawl was about 4 feet per second; but, after certain modification of details, M. Trouve has succeeded in giving it a speed of 6½ feet per second.

M. Trouve does not think that, with their present resources, ordinary workmen will be able to afford the expense of running these motors for their own use, and has therefore turned his attention more especially to making them applicable to the purposes of dentists, watchmakers, and amateurs, who need a cheap and efficient power for running lathes. Professors of physics will find in the machine a valuable acquisition to their cabinets; for it will serve as a powerful aid in the performance of numerous experiments which necessitate the use of mechanical power—such as actuating the Holtz machine, chromatropes, etc., etc. Physicians can also use it for making their electrical machines. Finally, there are undoubtedly in reserve for it numerous applications in the arts and industries.

The Penetrating Power of Light in Water.

The limiting depth to which light penetrates in water was some time ago stated to be 40 meters for Lake Leman, by Prof. Forel, who used albumenized paper in his experiments. M. Asper has recently made similar experiments on the Lake of Zurich by a slightly different method. He used the photographic plates, called "emulsion plates" (more sensitive than albumenized paper), and immersed them during the night of August 3, to depths of 40, 50, 60, 70, 80, and 90 meters. They were brought up after remaining twenty-four hours in the water, and treated with oxalate of iron. All the plates, without exception, were distinctly affected by the light. Thus the chemical rays penetrate in clear water to at least 90 meters depth.

Cause of the Decay of Teeth.

In a recent work by A. Weil ("Zur Aetiologie der Infectionskrankheiten"), says *Nature*, the author states the cause of the decay of teeth, whether external or internal, to be the schizomycetous fungus, *Leptothrix buccalis*, the mode of entry and propagation and the life-history of which he follows out in detail. The acids which occur in the mouth, especially lactic acid, while they may greatly promote the decay, cannot give rise to it. The fungus can readily be detected by its acid reaction. The author considers further, that, in many cases, diseases of various parts of the body can be distinctly traced to excretions from the mouth and teeth. Other observers had already traced a connection between decayed teeth and septic abscesses, in which was found a fungus similar to that which occurs in decayed teeth.

Experiments with Liquid Films.

Among some interesting experiments with liquid films recently described by Mr. Plateau to the Belgian Academy was the following: A flower like a lily, with six petals each about a inch long, was constructed in outline of fine iron wire, the wire being first slightly peroxidized by dipping it for an instant into nitric acid. This wire frame was then dipped into a glyceric soap solution, which, when it was withdrawn, left soap films over the petals. The stalk of the flower was then set upright in a support, and it was covered by a bell glass placed near a window so that the sky could be reflected in the films. In a few moments a most beautiful play of colors made its appearance. When the solution is in good condition it is found that such films will last for hours, giving a perpetual play of color over the flower. Again as regards the explosion of soap bubbles, we are apt to think that the whole of the film is converted simultaneously into minute spherules. Mr. Plateau has formerly shown that such is not the case, and has analyzed the course of the phenomenon. To prove the contraction of the bubble during its quick destruction, he now points out the following experiment: A bubble of glyceric liquid about eleven centimeters in diameter is blown with tobacco smoke, and placed in a ring. Having waited till the top appears blue, it is to be broken there with a metallic wire; whereupon, the mass of smoke is shot vertically upwards to a distance of a dozen centimeters, and then spreads out horizontally in the shape of an umbrella. It then rises more slowly and becomes diffused.

RABBITS INJURING TREES.—It is said sulphur and lard, when touched here and there, keep rabbits from injuring trees.

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THE CITY OF WORCESTER.

[*Continued from first page.*]

The lower forward saloon contains the officers' mess room, forward of which is a washroom for passengers, with four marble basins, the bar, and a small pantry, hot tables, etc. In this saloon there are 48 berths, in tiers of three; the berth tiers are built out from the sides of the vessel, so that there is a wide passage way between the skin of the vessel and the back of the berths, giving the most perfect system of ventilation ever in use on a steamboat. This saloon is lit with three electric light chandeliers. The after part of this saloon is bulkheaded off, so as to make sleeping quarters for the waiters, and contains 27 berths in a finely ventilated apartment. We will now ascend by a broad staircase to the main deck, and going forward we find the forecastle under the main deck, which contains 24 berths for the crew. The forecastle is well lighted and ventilated. Ascending again to the main deck in the "eyes of her" is a series of lockers; a large space here is bulkheaded for the windlass room, in which is placed a splendid Providence steam windlass, of the double cylinder pattern, made by the American Ship Windlass Company, of Providence, R. I., which handles her two anchors of 4,100 and 3,000 pounds of weight respectively, and her cables, which are each 75 fathoms long. The steam windlass gear is connected to the capstan on the deck above.

The electric lamp engine room contains a twenty-horse power electric engine for lighting 100 Edison lamps on every part of the boat. The City of Worcester is piped for gas, is provided with lamps for burning Downer mineral sperm oil, and also for complete lighting by electricity.

The boilers, three in number, are in the lower hold, lying fore and aft, and connected with two steam chimneys and two smokestacks. The boilers and coal bunkers take away no freight space, and in laying out the joiner work the steam chimneys are completely hidden from view. We now come to the after main deck freight space, and the magnificent front to the lower grand saloon. About 20 feet of the deck in front of the saloon, and abreast of the after gangways, are alternate strips of ash and black walnut. On the starboard side is the barber shop and washroom, and on the port side is the purser's room, which is entered from the saloon.

As to the staterooms: there is not a "poor" room on the boat. The average size of the rooms is about 7 by 7 feet by 8·6 feet high. The berths are fitted with woven wire mattresses, upon which are placed the best of hair mattresses and pillows, linen sheets and pillow-slips, rose blankets, and white Marseilles bed covers, and rich curtains and lambrequins. The light and ventilation are faultless; while the heating appliances for the winter season will render the boat perfectly comfortable, and in accord with the science of heating, as regards health. All the doors are hung on "Parliament" hinges, so that they can be made available, in case of dire necessity, for life-preserving appliances. There are twelve bridal rooms, each having a handsome curtained bedstead and other furniture in it. Amidships, on the deck, on either side, are the ladies' and gentlemen's toilet rooms. Passing forward to the end of the engine space, we come to the forward saloon, which contains the grand dining hall, the finest apartment afloat in the world for dining purposes. Over one hundred persons can be seated at once in this hall, with 23 feet 6 inches air space overhead, lighted with three large electric chandeliers, and in air as pure as can be breathed on the bosom of Long Island Sound.

Passing out on to the upper forward promenade deck, we find a nest of staterooms abaft the pilot house, the captain occupying the forward one on the starboard side, and the chief pilot the one on the port side, both connecting with the pilot house. Under the pilot house is a portion of the steam steering gear, the signal lockers, etc. The pilot house is finished in hard woods entirely, and contains a powerful steam steerer, which can instantaneously be connected or disconnected at will. A six-year-old boy can steer her, so far as strength is concerned. She is fitted with two of Riggs & Brother's patent binnacle heads and blinders, with liquid compasses, which are the finest combinations in this line we have yet seen on a steamboat.

The officers of the boat are quartered in a "Texas," built against the wheel houses, on top of the upper deck, and abreast of the gallows frame. Here are rooms for the chief and second mates, second steward, wheelsmen, watchman, express and baggage men, chief, first, and second assistant engineers.

The City of Worcester is a grand triumph of naval architecture and engineering skill, she is really beautiful and very fast. We will not enter into a detailed description of the joiner work; it is simply exquisite. She is a credit to her builders in every particular, having been built with more than ordinary care and with that scrupulous integrity for which the Harlan & Hollingsworth Company are so widely credited. The Norwich Line people are very justly proud of her. Nothing seems lacking in or about her, and the public who patronize her will say with us she is the "Belle of Long Island Sound." She has been built for a "business boat," and calculated for hard work, summer or winter, and although much money has been expended in beautifying her, the question of her strength and security has always been paramount, both in the eyes of the company who own her and those who built her. *Safety* first, *capacity* second, *speed* third, and *comfort* fourth, have been the objective points sought after, and we believe they have all been attained in a marked degree, and no one who will carefully inspect this marine beauty but will agree with us in this statement. She was built under the supervision of Captain S. A. Gardner, Superintendent of the N. and N. Y. Steamboat Line, and Charles W. Copeland, Superintending Engineer.

The officers are: Captain, H. C. Lamphere; Chief Officer, Richard T. McGeary; Chief Engineer, Joseph Carter; Second Assistant, John Smith; Steward, Thomas Byrnes.

The "City of Worcester" runs on the New York and Boston Line, via New London, and sails from Pier 40 North River.

Domestic Silk Growing.

The Women's Silk Culture Association opened its first exhibition in Philadelphia, Jan. 31. A prize of $500 offered by a firm in that city for the best exhibition of cocoons called out twenty-five competitors, including three from the Southern States. In all there were about thirty exhibitors of cocoons, floss silk, and reeled silk. Cocoons were shown surrounded by floss as spun by the worms on branches, and also as spun separately in small paper horns, according to the "cellular" system, as well as packed in bottles denuded of the floss. Single, double, and pierced cocoons were exhibited, with silk worms' eggs and specimens of the dead worms and moths. An especially interesting exhibit of the silk of foreign and domestic worms, and of the silk of a new species, fed on osage orange, was made by Prof. C. V. Riley, of the United States Department of Agriculture. The process of reeling was practically illustrated, and plush, taffeta, and satin looms were in operation. There was also a large variety of manufactured silk goods, including many hand-painted screens and banners.

In the two years since the society was started it has sent silkworms' eggs and slips of the mulberry tree to persons in nearly every State of the Union. The cocoons spun by the worms at the houses of those who have taken up this new industry have been purchased by the society. An ounce of eggs costs $5, and the worms hatched from them will make 40,000 cocoons. The society pays $1 a pound for cocoons, from which the silk is then reeled off, each pound of cocoons making about a quarter of a pound of silk. The reeling is done by an employe of the society, as there are no skilled American reelers.

Some specially interesting facts with respect to the practical condition and results of the industry were lately given to the Philadelphia *Public Ledger* by Miss Nellie Rossiter, a girl of fifteen, who has for a year or more made a business of silk-growing. By combining the work with teaching the art of sericulture Miss Rossiter has found it quite profitable. Just now, while home-grown silk is a curiosity, there is quite a demand for hanks of the reeled silk, untwisted, as specimens. There is also the beginning of a private business demand for hanks to be used in embroidery and in the manufacture of artificial flowers. The bright young lady teacher had on exhibition a cream-white lily with buds of glistening yellow, a beautiful piece of work, which was to be sent to Mrs. Garfield. It seemed to the reporter that it could scarcely be hand-made, so delicate and pure were the shining petals, but he was informed that the process was the same as that employed in making hair work. There are seven natural shades in cocoons, Miss Rossiter said—green, a brimstone yellow, straw, salmon, lemon, orange, and white; all of them making good effects to work with.

The hanks of reeled silk bring from $1.00 to $2.00—fifty cocoons making a hank. From 350 to 800 cocoons yield a pound of silk, according to fineness, and the silk brings from $3.50 to $8.50 from manufacturers, according to the skill exercised in the reeling.

Badly reeled silk, the American Consul in Lyons points out, is worth less than when on the cocoons. Accordingly he denounces as a fatal error the attempt of our silk growers to furnish reeled silk. Skillful reeling, he says, is an art to be acquired only by years of apprenticeship and constant practice, and not all who try can learn the trade. Reeling by ordinary reels requires a sufficiency of highly skilled labor thirteen hours a day for twenty cents, and even Italian women find it better to sell their cocoons; the idea of reeling is like each farmer's grinding his wheat to sell in flour. This much premised, the Consul sees no practical force in the objection that sericulture cannot be made profitable in this country because of the cost of labor, since the labor required does not necessarily involve any outlay. It is essentially a home industry, needing no severe manual labor, except for a few days at the end of the season, and when large crops are raised. In many of our States the wives and daughters of country people, now relieved by machinery from all the old-time labor of making clothing from the raw material, are unable to contribute to the family income except by going away from home; in the silk districts of Europe there is less agricultural machinery than here, and nearly every woman who works at sericulture takes for it time that would otherwise be turned to field labor; land is also dearer there, and taxes heavier. The buildings possessed by the peasants and used for sericulture are generally small and miserable, while here the roomy barns are empty during the cocoon season; better intelligence prevails here; some diseases which have been more or less prevalent in Europe have not appeared here, although many experiments in silk-growing have been made; and the prospect is that these differences will make the necessary cost of cocoon production here at least as low as in Europe. As to the matter of profit, the Consul thinks that the yield may be large enough to be very convenient to numbers of families, the reasonable product of an average family probably being $75 to $200. The great difficulty being to find a market for the cocoons, sporadic and hasty efforts should be discouraged; the product of a few isolated families in the interior could not be sold to advantage; but if several hundred families were engaged in the work in the same neighborhood, the charge of marketing their united crop would be only a small percentage of its value. Sericulture must have proper channels, just as wheat-growing must; the machinery need not be either complicated or expensive, but a system of nuclei in towns and cities is required. It might be well to interest in the subject the county and State agricultural societies and the village improvement clubs; and, besides the fifty or sixty millions which successful silk-growing might add to the country's production, it might effect a social improvement by increasing the cash income of many families and raising their scale of living.

How far the Silk Culture Association will succeed in reconciling the conditions of profitable silk production with our domestic customs and the requirements of our silk manufacturers remains to be seen. Thus far their efforts seem to have been cautious and judicious; and it may be that our inventors will so overcome the difficulties in the way of economical reeling as to make possible a much wider utilization of waste time in domestic silk production than our Lyons Consul anticipates.

Western Canal Projects.

To shorten the waterway between the West and the Atlantic, two new canals are proposed in Congress. The first contemplates a connection between the Mississippi River and Lake Michigan, by a canal sixty-five miles long, between Rock Island and Hennepin, on the Illinois River, there to connect with the existing Illinois and Michigan Canal, to Chicago. The cost of this canal would be close upon $4,000,000. The second canal is designed to provide a short cut across the State of Michigan, probably from Saugatuck to Detroit, a distance of 178 miles. The proposed course of the canal is along the Kalamazoo River to its head, thence eastward. The number of locks required would be twenty-two. Another line is also talked of, running from a point near Chicago through Northern Indiana and Ohio to Toledo. The estimated cost of a canal along the first described line is about $5,555,000. To insure an abundant traffic in grain by water eastward, it is further proposed to make the Erie Canal free.

Projected Railway Tunnels Under Water.

The Hudson River Tunnel at our doors, and the English Channel Tunnel, the construction of which has lately been undertaken by a powerful railway company, are not the only works of the kind in prospect or under way.

The contract for constructing a railway tunnel under the St. Lawrence, at Montreal, Canada, has just been taken by J. B. Bouilliard, for $3,500,000; this to include drainage and lighting, the work to be finished in 1885.

By a decree of the 30th December last the Italian Minister of Public Works granted permission to the Venetian Society of Construction to make the necessary studies for the construction of a submarine tunnel under the Straits of Messina. According to the plan of the Venetian Society the railway line of the tunnel will branch off from that of Eboli-Reggio, and, by means of a spiral tunnel, will descend to the level of the submarine line, rising to the level of the Messina-Patti line in a similar manner. The approximate length of the submarine tunnel will be about two miles and a half. The rock to be traversed is extremely hard, and the thickness of the stratum left between the top of the tunnel and the bottom of the sea will be about one hundred and twenty feet.

Steam Compression of Fluid Steel.

A method of compressing fluid steel, invented by H. R. Jones, of Pittsburg, is attracting attention in England. Steam pressure is applied to the top of the mould immediately after the metal is poured. The steam is drawn from a receiver fixed to the side of the ingot frame. The conducting pipes have one end permanently attached to the receiver, the other end being joined by a coupling with the lid of the mould. It is said that in practice no higher pressure than from eighty to one hundred and fifty pounds has appeared to be necessary; the higher pressure is used in the case of mild steels. Under this process the ingots are turned out free from porosity and with a perfectly level top. The steam, besides consolidating the ingot, cools the top of the ingot and allows it to be conveyed to the reheating furnace sooner than when the old process was used.

Society of Civil Engineers.

At the recent meeting of the American Society of Civil Engineers, in this city, the following officers were elected for the ensuing year: President—Ashbel Welch, of Lambertsville, N. Y.; Vice Presidents—James B. Eads, of St. Louis, and William H. Paine, of Brooklyn—Secretary and Librarian—John Bogart, New York; Treasurer—J. James R. Croes; Directors—Thomas C. Keefer, Ottawa, Canada; Thomas L Casey, Washington; and Joseph P. Davis, George S. Green, Jr., and George W. Dresser, of New York.

The annual report of the directors showed a present membership of 657, of whom about 150 reside in New York, the remaining members being scattered throughout the United States, Canada, and Mexico.

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The American Agricultural Association.

The annual convention of the American Agricultural Association is in progress in this city, a large number of delegates from the various agricultural societies of the country being present. In his presidential address Colonel N. T. Sprague spoke of the need of scientific knowledge on the part of farmers, and mentioned some facts which show the magnitude of some of our less considered industries. The poultry crop, for instance, was said to be in value more than one-third of that of the cotton crop. The butter product of this country for 1880 was 1,000,000,000 pounds, and of cheese 300,000,000 pounds, and in the same year we exported of cheese, 130,000,000 pounds, and of butter, 40,000,000 pounds, amounting to more than $20,000,000. A cheese made in Iowa, weighing more than three-fourths of a ton, took the prize, a silver medal, at the late great cattle and dairy show at Birmingham, England. The first shipment of cheese from this country was made in 1830, consisting of some 10,000 pounds. More than 200,000 head of cattle have been landed in Liverpool alone from this side of the water in the year 1881. How does our country compare with the leading dairy countries of the world? Great Britain and Ireland have 3,708,776 milch cows; France has 4,513,765; Germany has 8,962,221; America has 13,000,000 —we having 45 per cent more milch cows than any one of the leading dairy countries of the world.

The following gentlemen were elected as officers for the ensuing year: President—N. T. Sprague, of Vermont; Senior Vice President—Henry E. Alvord, of New York, with about forty associate vice presidents; Secretary—Joseph W. Reall, of New York; Treasurer—H. W. McLaren, of New York; Trustees—Messrs. C. W. Miller, T. A. Havemeyer, M. Folsom, Samuel Remington, and Lawson Valentine. Directors —F. D. Moulton, of New York; John J. Holly, of New Jersey; H. S. Kimball, of Georgia; George A. Crawford, of Kansas; Judson C. Stevens, of Ohio; T. S. Gold, of Maryland; J. B. Grinnell, of Iowa; D. H. Wheeler, of Nebraska; Thomas A. Galt, of Illinois; W. H. Jackson, of Tennessee, and A. M. Tulford, of Maryland.

The Mediterranean of the West, and its Lumber Trade.

Puget Sound, Washington Territory, perhaps the least known in the East of all our important water surfaces, is the one for which its acquaintances claim the largest future fame. It covers an area of 2,000 square miles, with a breadth rarely exceeding ten miles, and has a coast line of 1,5 0 miles. Its shores are bold and its waters deep, and it is quite free from shoals and reefs. The large lumber vessels which frequent the Sound are bothered to find good anchorage, scarcely less than a hundred fathoms of water appearing anywhere. So deep are the clear waters of this Mediterranean of the West, says a recent visitor, that a great commodore of the United States navy once innocently almost ruined the chances of one of the Puget Sound towns for being the final terminus of the Northern Pacific Railroad, by taking his ship up to the town. On sounding the water for anchorage ground, he failed to find as little as thirty fathoms of water anywhere, excepting one place, and that so near the bank that there was danger of the ship going ashore when swinging with the tide. He had to depart and anchor at the one other place, where there is a large natural bay, affording excellent advantages of the kind he was seeking.

The pure waters of this great Sound swarm with fish. There are eighty-five varieties, it is said. The salmon is the prince of fish here. The catch of salmon sometimes amounts to 40,000,000 pounds a year. A species of cod is also very abundant. It is dried and salted in large quantities.

The principal industry of the Sound is lumbering. The timber comprises ash, dogwood, alder, white oak, maple, cottonwood, spruce, hemlock, and laurel among other varieties; but these are in limited quantities. The greater part of the timber is yellow fir and cedar. This vast fir forest is thought to be the finest tract of valuable timber land on the face of the earth. It covers an area of about 32,000 square miles, according to the rough estimates which are current in the Territory. It is accessible from every point on the Sound, and from the ocean coast for a vast distance southward. The proprietors of the logging camps fell their first trees so close to the shore that they could be made to fall directly into the water if desired. The yellow fir is from 150 to 300 feet high, the trunks being from 5 to 12 feet in diameter at man's height from the ground The first lumbermen cut only the five and six foot trees. The saw-mills could not handle logs which were larger than that. Even yet there is no saw-mill on Puget Sound which can saw a log that is more than eight feet in diameter. The consequence has been that, at first, for many years, the axmen left the small trees and the very large ones ; and a piece of timber land which has been cut over once presents the singular phenomenon of a collection of small and of gigantic trees, with none of medium size among them. Since the enlargement of the mills, some camps are sending their men over the ground a second time to fell the big timber. The firs are cut off about five or six feet from the ground. The butts are generally unsound.

It requires from half an hour to an hour to fell a good sized tree. A large number of the fir tree trunks are unsound. The principal defect is what is called a "shake." It is a small crack inside the tree, formed by the swaying of the tall tree in the wind. When such a crack forms it soon becomes filled with the turpentine-like balsam which is characteristic of the fir. The woodchopper at work on a big tree is frequently astonished by driving his ax through one of these fissures and seeing several gallons of turpentine suddenly run out. It the tree, when felled, is found to be defective, it is left where it lies. If sound it is cut up into logs from 30 to 120 feet in length and hauled out of the woods. Sticks 150 feet long are sent out.

The United States is exceedingly jealous of this vast tract of valuable timber land. It permits the timber to fall only into the hands of those who wish to do a legitimate business in logging. The regulations are quite strict both as to keeping the land out of the hands of speculators, and as to the waste of timber. To buy a square section of timber land costs $1,600. The logger employs about six men and a team of eight oxen. He builds a rough camp and boards the men. His running expenses are about $35 dollars a day, and he is able to get out of the woods about 30,000 feet a day. The rafts of logs are towed off to the neighboring saw mill at a cost of $1,50 per thousand feet, and he sells them there at the rate of $6 per thousand feet.

The yellow fir is known in the East as Oregon pine or Puget Sound pine. It is a wood of great value, owing to its toughness and strength. The first cargoes of it were sent to San Francisco about twenty-five years ago. The length and beauty of the timber attracted the attention of Admiral Farragut, who caused tests of it to be made at the Mare Island Navy Yard. Still other tests were made at the Navy Yard in 1878 by Constructor Much, for the purpose of discovering the sizes of scantling required for building the United States screw steamer Manzanita with Pacific coast woods instead of with oak. Tests have also been made recently in the oak. It is proved that yellow fir is fully the equal of Eastern white oak in tenacity, strength, and toughness. There is no doubt left upon the point, and yellow fir is now the universal building wood on the Pacific coast.

Importation of Air.

To discourage the introduction of American canned meats into Germany the customs officers have contrived a threefold duty upon such commodities. The meat is taxed for itself; the can is taxed as fine iron ware; and the labels are compelled to pay another high duty as chromo-lithographs. Apparently to justify the customs charge upon the covering of imported goods, a Berlin paper relates how Alexander von Humboldt once took advantage of the exemption from duty of the covering of articles free from duty, formerly if not now the rule in France. In the year 1805 he and Guy-Lussac were in Paris, engaged in their experiments on the compression of air. The two scientists found themselves in need of a large number of glass tubes. This article was exceedingly dear in France at the time, and the rate of impost upon imported glass tubes was something alarming. Humboldt sent an order to Germany for the needed articles, and gave directions that the manufacturer should seal up the tubes at both ends, and put a label upon each tube with the words *Deutsche Luft* ("German air"). The air of Germany was an article upon which there was no duty, and the tubes were passed by the customs officers without any demand, and arrived free of duty in the hands of the two experimenters.

New York Harbor Improvements.

Two schemes for the improvement of New York Harbor have just been brought before Congress. The first contemplates the cutting of a deep and wide and straight channel through Sandy Hook bar, at a point between the "Swash" channel and the "fourteen foot" channel. The completed channel is to be 500 feet wide, and 31 feet 6 inches deep; the cost is put at $5,500,000. The bill provides that the contractors are not to resort to the method of shutting off the flow of water through any of the several channels over the bar by dams or jetties, and are not to impede or contract the natural flow of water through them for the purpose of causing an increased flow through any one particular channel in order to gain a temporary scour therein. The work is to be done under the inspection of the War Department, and it may be stopped at any time when it appears that the provisions of the bill are not being carried out in the opinion of the officers of the department.

The second project contemplates the construction of a ship canal extending from a point between Ellis Island and the docks of the Central Railroad of New Jersey to a point between Constable Hook and Robbins Reef. Assistant Engineer Doerflinger, who was specially detailed by the War Department to make the examination to determine the feasibility and cost of the proposed canal, reports to the main question as follows: "To obtain access to the deep water of New York Harbor, it is the desire of the owners of the land bordering on the flats, and of others interested in the utilization of the flats for the purposes of trade and commerce, that a ship canal be constructed about five hundred feet outside of the pier line, as at present established, from the docks of the Central Railroad to Craven's Point, the channel to continue in a straight line to the deep waters of the Kill von Kull. The Riparian Commissioners of the State of New Jersey propose, should the construction of the channel be undertaken by the United States, to establish a new pier line to coincide with the westerly limits of this channel, so that the future pier-heads will thus be accessible from the navigable waters of the bay. In addition to affording a means of deep-water communication between future piers that may be built on the flats and the navigable waters for the harbor, the channel would somewhat shorten the distance from points on the Hudson River to points on the Kill von Kull, and would furnish a more sheltered waterway to the numerous tows now playing between these points, and one more free from strong head currents than the main ship channel."

Accompanying Assistant Engineer Doerflinger's report is a detailed estimate of the cost of the proposed channel—21 feet deep at mean low water and 300 feet wide at the bottom —which places the total cost at $7,134,980.

The Probable Nationality of the Mound Builders.

The question, Who were the "Mound Builders?" is one that still remains open in American archæology. The most recent expression of opinion on the subject is given by Dr. Daniel G. Brinton in an interesting article in the last number of the *American Antiquarian*.

After reviewing the historical evidence on the subject, Dr. Brinton says that it would appear from all the facts collected that the only resident Indians at the time of the discovery of America who showed any evidence of mound building comparable to that found in the Ohio Valley were the Chahta-Muskokees—the great and powerful family which inhabited what we now call the Gulf States, and which embraced the tribes known as the Choctaws, Chikasaws, Muskokees or Creeks, Seminoles,, Allibamons, Natchez, and others. The evidence is sufficient to justify us in accepting this race as the constructors of all those extensive mounds, terraces, platforms, artificial lakes, and circumvallations which are scattered over the Gulf States, Georgia, and Florida. The earliest explorers distinctly state that such were used and constructed by these nations in the sixteenth century, and probably had been for many generations. Such is the opinion arrived at by the well known authority, Col. C. C. Jones, who, referring to the earthworks in Georgia, writes: "We do not concur in the opinion so often expressed, that the Mound Builders were a race distinct from and superior in art, government, and religion, to the Southern Indians of the fifteenth and sixteenth centuries." It is a Baconian rule, which holds good in every department of science, that the simplest explanation of a given fact should be accepted; therefore if we can point out a well known race of Indians who, at the time of the discovery, raised mounds and other earthworks, not wholly dissimilar in character and not much inferior in size to those in the Ohio valley, and who resided not very far away from that region and directly in the line which the Mound Builders are believed by all to have followed in their emigration, then this rule constrains us to accept for the present this race as the most probable descendants of the Mound tribes, and seek no further for Toltecs, Asiatics, or Brazilians. All these conditions are filled by the Chahta tribes.

The size of the southern mounds is often worthy of the descendants of those who raised the vast piles in the northern valleys. Thus, one in the Etowah Valley, Georgia, has a cubical capacity of 1,000,000 cubic feet. The Messier Mound, near the Chatahoochee River, contains about 700,000 cubic feet. Wholly artificial mounds, fifty to seventy feet in height, with base areas of 200 by 400 feet, are by no means unusual in the valley of the Gulf States. With these figures we may compare the northern mounds. The massive one near Miamisburg, Ohio, sixty-eight feet high, has been calculated to contain 311,350 cubic feet—about half the size of the Messier Mound. At Clark's Works, Ohio, the embankments and mounds contain about 3,000,000 cubic feet. Greater than any of these is the truncated pyramid at Cahokia, Illinois, which has an altitude of 90 feet and a base area of 700 by 500 feet. There is apparently not so great difference between the earth structures of the Chahta tribes, and those left us by the more northern Mound Builders, that we need suppose for the latter any material superiority in culture over the former when first they became known to the whites; nor is there any improbability in assuming that the Mound Builders of the Ohio were in fact the progenitors of the Chahta tribes, and were driven south probably three or four hundred years before the discovery.

Distinction of Wool, Silk, and Cotton.

A. Remont communicates a short process to detect or separate these fibers, which may suffice for ordinary purposes. The fabric to be examined is first dipped, for fifteen minutes, in boiling water containing five per cent of hydrochloric acid, for the purpose of removing coloring matter and sizing; it is then washed and dried. If at all possible, the woof is then to be separated from the warp, and each examined separately, according to the following scheme:

I. Burn a few fibers.

1. An odor of burnt urine is developed. If this is the case, heat a few fibers with solution of soda, and examine the vapor given off; if ammonia is present, this indicates the presence of an *animal fiber*.

A. Dip a few fibers into a boiling solution of basic chloride of zinc.

a. The fiber dissolves completely.—*Silk*.

b. On the addition of hydrochloric acid, an abundant flocculent precipitate is produced.—*Silk* mixed with *wood* or vegetable fiber.

c. The chloride of zinc does not dissolve it. Remove the fibers to a boiling, moderately dilute solution of soda.

It dissolves completely.—*Wool*.

It dissolves partially.—*Wool* and *cotton*.

2. No odor of burnt urine is developed.—*Vegetable fiber*.—*Jour. de Pharm. et de Chim.*, 1881, 135.

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The Jeannette's Long Drift.

The hope that, notwithstanding the disastrous fate of the Jeannette, the expedition might have made important discoveries in high latitudes before she was caught in the ice has been dispelled. It is now known from the survivors that from the time she entered the ice, in the vicinity of Herald Island, September 6, 1879, she was practically helpless. For nearly two years she drifted with the ice northwestward; while for a year and a half she was leaking badly, her fore-foot having been "twisted" on the first day of 1880. She was finally crushed by the ice June 12, 1881. No discoveries of moment were made during the long drift. Lieutenant Danenhower telegraphed from Irkutsk, February 1, that the whereabouts of Commander De Long had been discovered.

To Make Rubber Packing Air and Steam Tight.

The packing is brushed over with a solution of powdered rosin in ten times its weight of stronger water of ammonia. At first, this solution is a viscid, sticky mass, which, however, after three to four weeks, becomes thinner and fit for use. The liquid adheres easily to rubber, as well as to wood and metal. It hardens as soon as the ammonia evaporates, and becomes perfectly impervious to liquids.

MULTIPLE PRESSURE SUGAR MILL.

WITH INJECTIONS OF WATER, STEAM, AND LIQUOR BETWEEN EACH PRESSURE.

The special feature of this sugar mill—the first which has been made with such a large number of rollers—is that the canes are not only submitted to successive and increasing pressures, but that, while passing under the rollers, before each of the last three pressures, they are injected at the will of the attendant of the apparatus, with either steam, liquor, or water. The liquor used for this purpose is derived from the two last pressures, and is directed on to the preceding ones in the same order as their degree of density according to the saccharimeter.

It is this system which the inventors have called the "Mutiple Pressure Sugar Mill," for which they have recently taken out a patent.

It is well known that, according to different analyses, sugar cane when ripe, and when freshly cut, has the following composition:

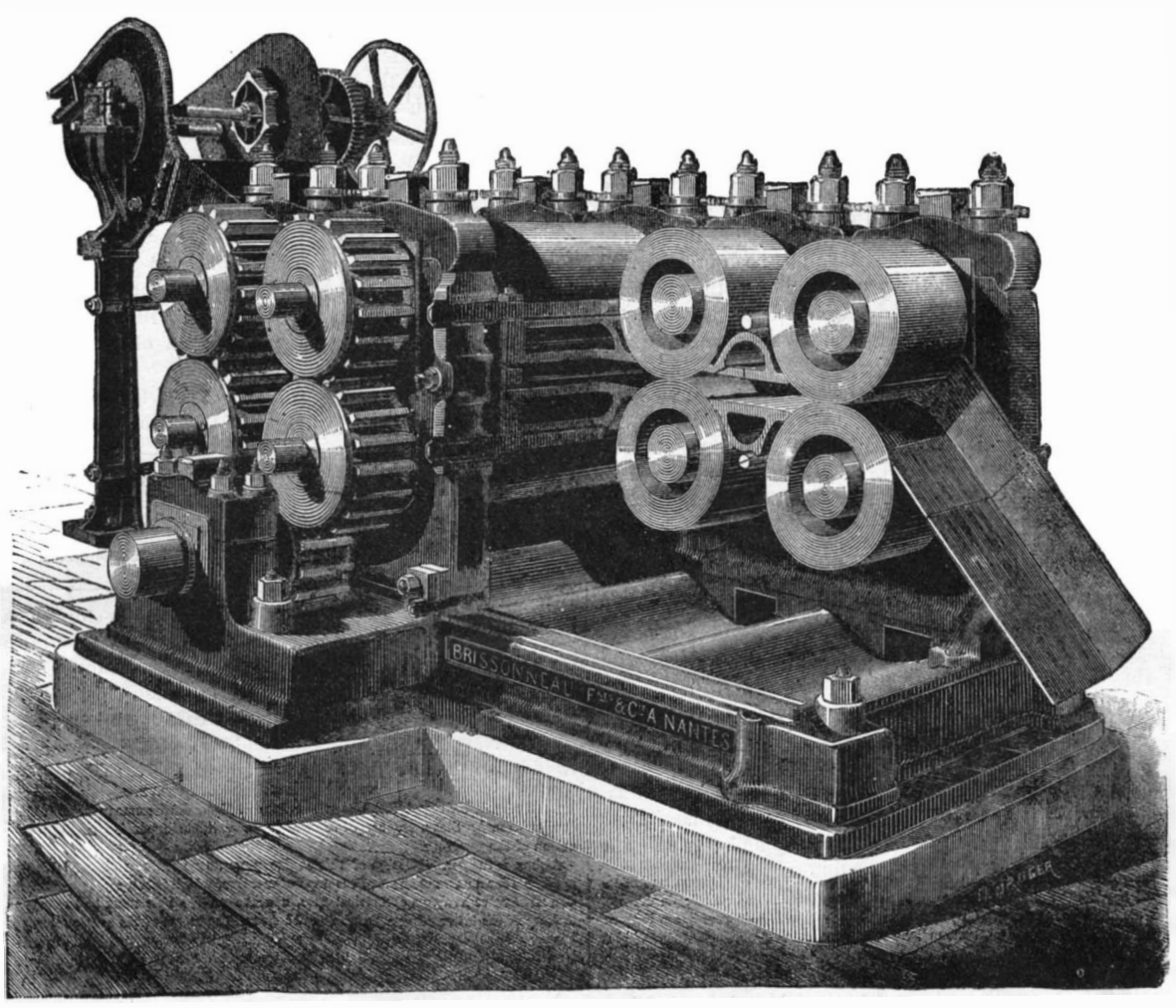
Water, 72; sugar, 18; cellulose and ligneous matter, 9·50; insoluble salts, 0·50; total 100.

Up to the present time, with the different forms of apparatus employed for extracting the juice from sugar cane and the use of the most improved machinery, such as *triple effets* and vacuum pans, no more than from 8½ to 9 kilogrammes of sugar have been obtained per 100 kilogrammes of crushed cane; and this result has only been obtained in exceptional years, when the weather has been most favorable for the development and ripening of the canes.

The home sugar industry, however, can reckon a much larger percentage. This is easily explained by the fact of its being able from its situation to employ, to the best possible advantage, all the new processes and machinery as they are brought to light, more especially in the large European industrial centers. This superiority in the quantity of sugar obtained, and the number of large works which have been erected during recent late years, have increased in considerable proportions the home sugar production; and as the consumption has not kept pace with this production, the value of sugar has consequently decreased. As the colonial planters could not, without danger to their industrial existence, submit to the fall of price which has taken place, they have endeavored to discover a remedy for this state of things. This remedy has been found by extracting from the cane itself the greatest possible quantity of the 88 or 90 per cent of juice which it contains.

As the other forms of apparatus, with the exception of the mill, have been successively modified and brought to a comparative degree of perfection, it followed that the roller mill had also to be improved.

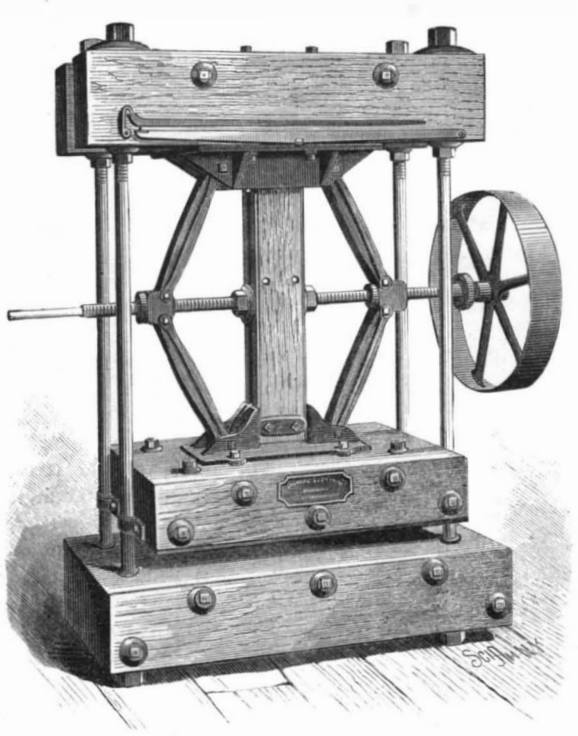
This new apparatus of Messrs. Lahaye & Brissonneau, of Nantes, France, embodies the latest improvement in this direction. This mill, of which the accompanying figure represents a perspective view, is furnished with two pairs of rollers, which are shown in cross section. It has already been working for two years in Guadaloupe, at the Courcelles Sugar Works, belonging to Messrs. Dubos frères.



MULTIPLE PRESSURE SUGAR MILL.

PRESS FOR THE MANUFACTURE OF BELTS.

The press shown in the engraving is particularly designed for the manufacture of belts twelve inches or more in width; are used by a number of the leading manufacturers of the country; has a wood frame with a heavy iron plate, planed smooth and true, bolted to the underside of platen. On the base of the press is placed a sheet of rubber the size of the platen and an inch or more in thickness; and between the rubber and iron plate the belt, after being connected, is pressed. The rubber plate seems to bring the pressure to bear on all parts of the belt alike, even if the thickness of same should be unequal.



BOOMER & BOSCHERT'S PRESS FOR THE MANUFACTURE OF BELTS.

The press is designed to be run by power, but may be used as a hand press, a pulley being keyed fast to one or both sides of the press screw and actuated by a countershaft on which are pulleys for both crossed and straight belts, for running the press up or down, as required. As the screw is run rapidly the press can be operated very quickly. Upon the head beam is fastened a system of levers called an "indicator," and which seems to show the amount of pressure being applied, so that having found the requisite amount of pressure to do a certain kind of work, the same pressure can always be applied.

This firm also manufacture presses made entirely of iron for any width of belt, and to be worked by hand or power, as may be preferred.

Further information may be obtained by addressing Messrs. Boomer & Boschert, 96 West Water street, Syracuse, N. Y.

American Manufactures Abroad.

Although the general impression is that the important position held by America in foreign markets is due almost wholly to our immense production of raw material, yet American manufactures also obtain a recognition, all the more notable from the fact that it is generally reluctant. Even in Russia, to which our direct exports are inconsiderable, the reputation of American hardware is so high that it is sold to some extent by German and English houses, but the most of the goods sold as American are imitations. The American Consul at Moscow says even the names of the makers of goods selected for imitation are retained in the spurious and inferior products. The Consul at Crefeld, Germany, reports that the preference for American sewing machines is so great that the German manufacturers adopt the brands of American makers, and attempt to justify the deceit on the ground that the makers' names are mere commercial terms, like Bessemer steel or Windsor soap, and do not designate any special make. It is also reported that German manufacturers vigorously assail the character and quality of American goods, while constantly putting cheap imitations of them on the market. An adjustable chair vaunted as superior to anything made in America was found, on examination, to be an exact imitation of an American chair. Nevertheless, stores in Germany making a specialty of the sale of American sewing machines, stoves, agricultural implements, and labor-saving articles, are doing a flourishing business. The market would become extensive were it not for the tariff imposed by the empire. A growing trade in American shirtings and jeans has already been wiped out by tariff exactions. But while American products are grudgingly received, there is no indisposition to appropriate the discoveries of American inventors. Our consul at Lyons reports that a machine for testing silk fiber, which is coming into general use in France and Italy, is the design of an American inventor.—*N. Y. Sun.*

The Chicago Cable Road.

The first car of the new cable road for street service in Chicago was run over the road January 26. The trial is reported highly satisfactory to the managers and directors of the enterprise. A speed of eight miles an hour, it is said, can be maintained without difficulty.

Manufacture of Wooden Shoes.

The London *Globe* says that the wooden shoe is quite a national institution of France; and in Brittany, more than in any other part of the country, its "clank" is heard everywhere. People wear it almost habitually there who would fight shy of it elsewhere, save on high days, holidays, and *en grande tenue*, when "there is nothing like leather." Hence follows the necessity for a sufficient large brotherhood of sabotiers, who, as they could not possibly live in towns or large villages, by reason of the cost of transport of the rough material exceeding the price of the manufactured goods—Mam'sell Marie's well-made shoon aforesaid may be bought for a mere trifle—are forced to reside in the woods and forests, or other places where suitable timber may be available. He is a regular Bedouin, this sabotier, and, like that nomad, can say, "The rope which holds my tent has seen all cities perish." The never-altering end and aim of a Breton wooden shoemaker's being is to fabricate sabots, and out of this groove he and his never run. Such as the father is, such is the son, and, for the matter of that, his daughter also. Children, so to speak, are to the manner born of making sabots, and at so tender an age as five or six years they may be seen smoothing, blackening, varnishing, stringing together in lots the coverings which their parents and other relatives have cut, shaped, and hollowed out into chausures for the human foot. When a sufficient load of sabots has been completed at a certain fixing, the sabotier goes with it to the nearest village or town where his wholesale dealer resides, and to whom he disposes of the lot. With the money thus obtained he replaces a few articles absolutely necessary for his wants, and with the residue pays for timber already bought, felled, and utilized.

REMEDY FOR HICCOUGH.—Dr. M. S. Leslie, of Lexington, Ky., says that the best remedy in ordinary hiccoughs is about twenty-five grains of common table-salt placed in the mouth and swallowed with a sip of water.

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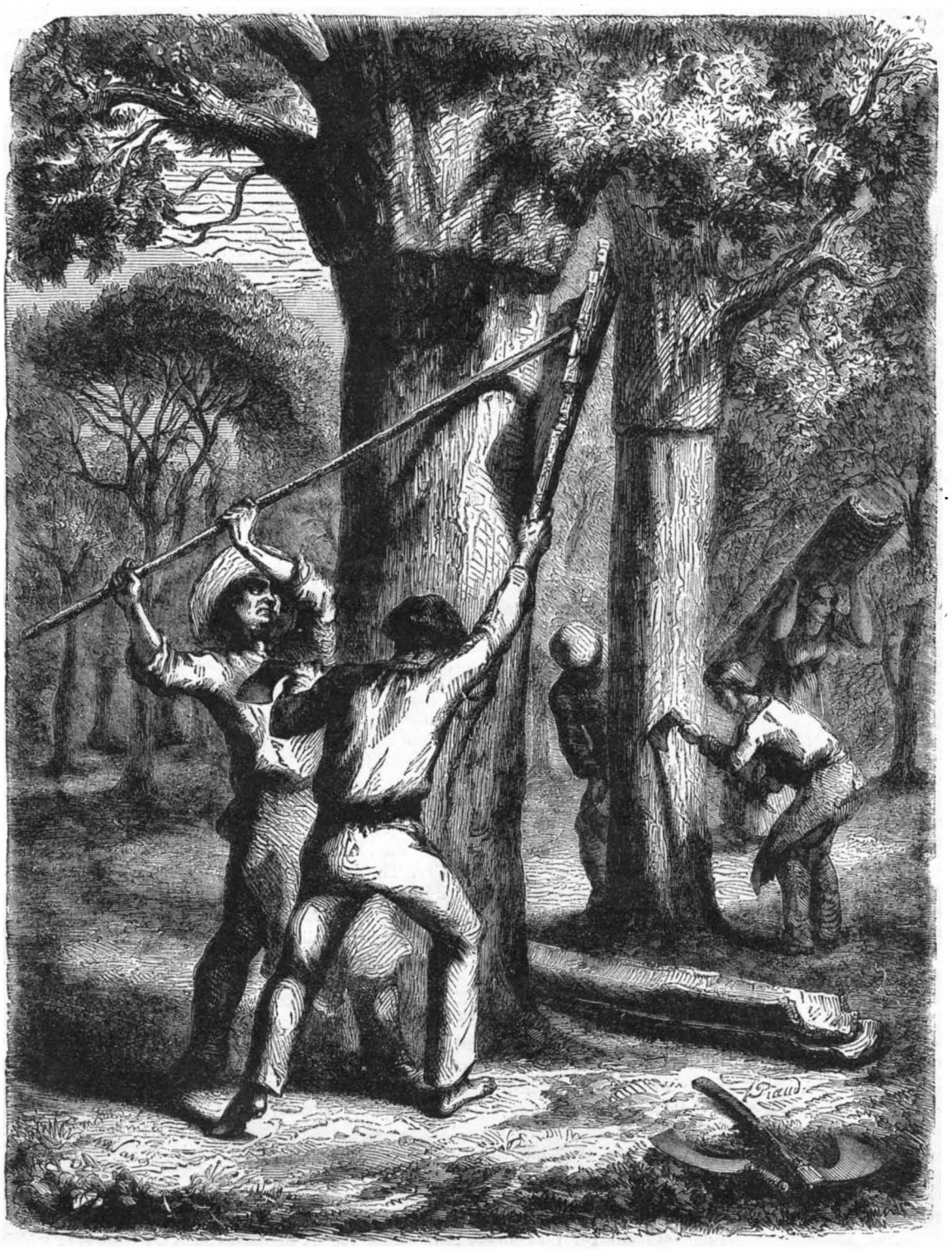
THE CORK OAK.

The tree from which is obtained the cork of commerce is a species of evergreen oak (*Quercus suber*), growing in several of the departments of France, in Spain, Portugal, Sicily, Italy, and Algeria. It is principally cultivated, however, in Spain and Portugal. This species of oak loses its foliage only in the month of May, and when the new growth of leaves is sufficiently strong to replace the old ones of the preceding year. It flowers in May, and its fruit is fit for gathering only in the month of November of the next season; that is, eighteen months after flowering. Its acorns are less astringent than those of other species of oaks, and are used for fattening swine, sheep, and poultry. They are also employed to a considerable extent in the manufacture of certain kinds of fecula.

The cork oak flourishes best in arid, sandy soils, and, under favorable conditions reaches a height of 40 to 50 feet, with a circumference of 10 to 13 feet. The trunk, from its base up to where the first branches begin, is 9 to 13 feet long; and it is this portion of the tree from which is peeled the bark that constitutes the cork of commerce. This substance, "cork," consists of the outer layer of bark, which, by annual additions from within, gradually becomes a thick, spongy mass, the rapidity of growth determining the quality of the bark. A quick growth is represented by a fine grain and light weight; a slow growth producing a contrary effect. The bark, if allowed to remain on the tree, becomes so fissured and cracked as to be unfit for use. There are two varieties of the cork bark known in commerce, the white and the black; the former of these is the product of trees growing in France, and the latter of those cultivated in Spain. The white is superior to the other on account of its greater beauty, its smoothness, and its greater freedom from cracks and inequalities. It is of a yellowish-gray color on both surfaces, and cuts (on account of its much finer grain) more smoothly than the black. The operation of stripping the bark takes place when the trees have attained the age of fifteen to twenty years. In the month of August, when the sap is in movement, the workmen begin by making a transverse incision in the bark, just beneath the branches, and another at the base of the tree; then two longitudinal incisions are made, and the bark beaten on every side with the back of an ax, in order to loosen it from the subjacent liber; then, by means of their ax handles, or of levers prepared for the purpose, they pry off the loosened bark, which falls to the ground in cylindrical pieces. During this process the greatest care is used not to injure the newly formed layer of suber or cork lying beneath. After collection, the rough exterior of the bark is either rasped off or slightly charred, then piled in stacks and allowed to dry, during which process it loses one-fifth of its weight. In the charring process, the pores become closed up, and the cork is rendered denser or receives what is technically known as "nerve." In this state, after being flattened, it is cut into lengths of about four feet and put up in bales for export.

The stripping takes place about every ten years, the product improving with each successive removal. The operation seems to be beneficial to the tree, for if the bark be allowed to remain on it naturally, the cork oak rarely lives longer than fifty or sixty years; if, on the contrary, it be removed periodically, the tree continues to flourish from one hundred to one hundred and fifty years. The first product is always of a very rough and woody nature, and useful only in rustic work or as a tanning material. The second stripping is also of a coarse nature, and useful only for floats for nets, water conduits, and such purposes.

The economic uses to which cork is applied are much too numerous to pass in review; it will be sufficient to speak of one only, that of the manufacture of stoppers. For the purpose of stopping bottles cork was not generally used till near the end of the seventeenth century. Many substitutes for it have been proposed, but except in the case of aerated liquids none of these have been generally employed. In the manufacture of bottle corks, the bark is cut up into slips, which, by means of gauges, are made narrow or wide, according to the size of the corks or bungs wanted. The slips are then cut into squares or "quarters," which are trimmed into the required shape by means of a very long, thin knife, kept very sharp. In this operation the knife is kept immovable while the cork is drawn over its edge by the workman. The corks are then thrown into baskets and sorted out according to size by women and children. Cork cutting in Catalonia and the South of France furnishes a livelihood for a considerable portion of the population of those districts. Several attempts have been made to cut corks by machinery, but they have not succeeded in superseding hand labor, which is comparatively cheap abroad. The machine which is principally used for this purpose was exhibited in operation at the Paris Exhibition; it was worked by a woman, and near her was seated a man patiently carving out his corks (with the usual knife), quite as neatly and nearly as rapidly as the machine. The cork-cutting machine is an instrument similar to a carpenter's plane working in a groove, the knife being horizontal. The slip of cork is placed between two chucks, and by pushing the plane along the groove the cork is caused to rotate in front of the knife as it passes along.



WORKMEN GATHERING CORK.

No economic use is made of the wood of the cork oak except that of fuel, although it might be useful as a timber, since it is very heavy and as hard as boxwood.

Unsinkable Ships.

The great loss of life caused by foundering, and the many very narrow escapes, is more than suggestive.

First-class steamers are generally divided into six watertight compartments; practically, only two of these are of any use, namely, the collision bulkhead and the after one, any of the others filling would sink the ship. Even if they would not, one never has been seen strong enough to stand the weight of water with a ship tumbling in a seaway.

All passenger ships should be unsinkable. They should have longitudinal divisions running the whole length of the ship, through engine room and all, and have athwartship bulkheads in such small divisions as would render their sinking impossible. Their strength should be properly tested. The whole thing is only a matter of money. An unsinkable ship is entirely feasible. She would, of course, be obliged to have twin screws. They would be a great advantage, as a total breakdown would be nearly impossible. Light masts could be carried, and yards done away with. Experience has shown that in full-powered steamers they are more harm than good.

A very small sailing vessel hitting an iron steamer stem on will knock a hole in her.

Competition is forcing a dangerous economy in everything at sea except gilt and show. The rates of passage money are so low that without large cargoes, with a very few exceptions, it is impossible for ships to pay.—*American Ship.*

The Manufacture of Tiles.

Tiles, being a thinner ware than bricks, have to be made of a purer and stronger clay. They also require more careful treatment, but the process of manufacture is not essentially different. There are many varieties of tiles, but for practical purposes they may be reduced to three, namely, paving tiles, roofing tiles, and drain tiles. In weathering, the clay is spread in layers of about two inches thickness during winter, and each layer is allowed the benefit of at least one night's frost before the succeeding layer is put upon it.

Sometimes the process is effected by sunshine. The comminuted clay is next placed in pits and allowed to mellow or ripen under water. Then it is passed through the pug mill, and the tempered product cut in thin slices with a piece of wire fixed to two handles, in order to detect any stones, and then passed through the pug mill again, after which it is generally ready for moulding. To take the case of pan tiles (hand moulded), the moulder turns the tile out of the flat mould on to the washing-off frame, on the covered surface of which, with very wet hands, he washes it into a curved shape. Then he strikes it with a semi-cylindrical instrument called the splayer, and conveys it on this to the flat block, where he deposits it, with the convex side uppermost, and removing the splayer, leaves the tile to dry. The tile is afterwards beaten on the thwacking frame, to correct any warping that may have occurred, and trimmed with the thwacking knife. In the kiln, which is constructed with arched furnaces at the base of a conical erection called the dome, the tiles are closely stacked in upright position, on a bottom of vitrified bricks. The fuel used is coal, and the burning continues usually about six days. In making pipe drain tiles, the clay is first moulded to a proper length, width, and thickness, then wrapped around a drum; the edges are closed together, and the tile is carefully shaped by the operator's hand, sometimes assisted by a wooden tool. Tiles as well as bricks can be made by machinery; with suitable dies almost any form of tile may be thus had, which is producible by the advance of a given section of clay parallel to itself. In other machines pressure is exerted on the clay in a mould.

The manufacture of tesseræ and encaustic tiles has been brought to great perfection in recent times, through the enterprise especially of Mr. Minton. It is a revival and extension of a very old art, which originated probably with the Greeks. The tessellated pavements of the Romans, of which many specimens are still extant, were formed of small pieces of stone or marble of various colors, bedded one by one in a layer of cement. The principle on which tesseræ are now made, is that dry and finely powdered clay, compressed between steel dies, is changed into a very compact and hard solid body, a fact first observed by Mr. Prosser in 1840. The solid pieces, which are thus produced in a screw press, are inclosed in earthen ware cases or pans, called seggars, and fired in a potter's kiln, after which they are ready for use, unless they are required to be glazed, in which case they are dipped in a glazing composition and again fired. The mode of setting the pieces differs essentially from the Roman method. In manufacture of the tiles called encaustic, in which various designs are produced by addition of clays of different color from that of the ground, the clays first undergo sundry washings and purifications. A portion of the kind which is to form the ground first receives

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an impression, in the plastic state, from a plaster in relief. The bulk of the tiles is made up with coarse clay added in a frame, and this is solidified in a screw press. Then comes the filling-in of the design, which the maker does by spreading the colored clay in a creamy or slip state on the indented surface. After a few days' evaporation the surface is scraped or planed, and the tile passes successively to the drying house and the oven. The colors desired in encaustic tiles are sometimes those given by the clay in ordinary treatment, sometimes they are obtained by staining with manganese, cobalt, etc. The products of this branch of manufacture are much admired.

The fine ornamental work of various shapes and colors known as terra cotta has of late been much used, especially in the facing of public buildings, and with fine effect.—*American Pottery and Glassware Reporter.*

AGRICULTURAL INVENTIONS.

Mr. Thomas Haxton, of Gore, Otago, New Zealand, has patented an improved harrow, which is constructed of sections of metal, each section made in one piece, bent horizontally in triangular form, with eyes at the ends of the arms, and also bent vertically below the eyes to form teeth, whereby, when the sections are linked together, a complete flexible harrow is made.

An improved harvester finger bar has been patented by Mr. Abner D. Dailey, of Riley, Ind. This invention relates to improvements in the finger bars of that class of harvesters in which the cut grain falls upon an endless belt or carrier in rear of the cutters, which belt conveys the cut grain to an elevator, and thence to a grain binder. In this class of harvesters, as now constructed, the endless belt or carrier is arranged above the cutter bar, and has its front edge a short distance in rear of the cutter bar, whereby an open space is left between the endless belt and the back of the cutter bar, into which short grain and cut weeds fall, causing the loss of the short grain and the clogging of the belt by the weeds and short grain winding around the belt rollers. To remedy these defects is the object of this invention. The finger bar is composed of a metallic plate bent so as to form upper and lower horizontal flanges parallel with each other, the frame of the endless belt being secured between the flanges and fingers bolted to the upper flange, which upper flange is also provided with slots for the passage of the endless belt in its revolution, whereby the outer edge of the endless belt revolves in contact with the back of the cutter bar, and the upper face of the belt is flush with the cutter bar and carries the butts of the wheat as fast as the heads, thus bringing the stalks straight to the elevator.

An improved cornstalk cutter has been patented by Mr. Alexander Cherry, of Saratoga, N. Y. The invention consists in a cornstalk cutter having two parallel runners with downwardly projecting plates attached to their sides and two outwardly inclined side bars carrying laterally projecting knives.

Silk Raising at the South.

The possibility of producing silk with profit is beginning to agitate the people in some parts of the South, and visions of prospective wealth are giving an impetus to the enterprise. A writer in the Louisville *Courier Journal* says:

Silk culture in the South can be carried to the greatest success, owing to the mild climate and the long seasons of good weather. Silk culture can be managed successfully and profitably in the South in rooms of all sizes and kinds, so they are dry and airy. I have sent samples of raw silk grown here in Memphis by myself and friends to Lyons, France, and the reports of it are the highest, commanding $11 a pound of twelve ounces. The French of Lyons and Marseilles express their astonishment when informed that we have mulberry trees in great quantity without trouble, even whole forests of them.

One person raising silk in the South can make as much as five persons can with cotton, and with an outlay of only a few dollars in starting. I have, at great expense and labor, prepared an exhibit of silk raised in the South for the Atlanta Exposition, but have been delayed in getting it placed in position, owing to a severe spell of sickness recently.

A number of capitalists of Memphis, together with myself, are to establish a filature of silk, also a moulinage for reeling and preparing the silk raised in the South for the looms in the East. To give your readers an idea of the silk industry in the United States at present, I give an article from a journal devoted to the silk industry. It says:

"No industry has had more wonderful growth in this country than the manufacture of silk. There are now invested in this industry about $18,000,000; the total product of the silk looms annually is $27,000,000, and there are 18,000 operatives, receiving in wages annually $6,000,000. In the town of Paterson, N. J., there are 32 silk-weaving mills, having 74,000 throwing spindles, 23,000 braiding spindles, 730 power looms, 563 hand-weaving looms, and employing enough people to make a good sized city. The first silk mill was established there in 1840. The demand for raw silk is so great in this country (United States) that most of the raw silk has to be imported from France and to be woven by the looms in our country."

I have prepared, by careful and laborious work, a tabulated form of each day's work to raise silk worms, and which, if followed by your readers who raise silk in the future, will insure certain success.

Any and all kinds of our mulberry trees will produce good silk. Even the osage orange, that grows so plentiful, will make good silk.

I desire to lay before your readers, in the following tabulated statement, the daily work necessary to raise 40,000 silk worms, which will produce 1,000 pounds silk cocoons, worth from $2 to $250 per pound:

Days.	No. of lb. leaves con.	No ft. space occupied.	Operations for each day.
1st	¼	1	Removed worms as
2d	½	2	hatched to trays.
3d	1½	2	Same.
4th	2	2	Same.
5th	2	2	Same.
6th	2½	3	Change litter and
7th	3	4	increase space.
8th	5½	5	Same.
9th	8	8	Same
10th	8	8	Same.
11th	8	19	Change litter and
12th	8	20	increase space.
13th	12	20	Same.
14th	24	20	Same.
15th	8	24	Same.
16th	24	24	Same.
17th	24	45	Change litter and
18th	24	48	increase space.
19th	34	48	Same.
20th	36	50	Same.
21st	3	50	Same.
22d	30	75	Change litter and
23d	45	75	increase space.
24th	75	75	Same.
25th	98	75	Same.
26th	130	100	Change litter and
27th	160	100	increase space.
28th	180	102	
29th	Cease eating; ready to spin silk cocoons.		

In three days they finish their cocoons and then cut out, transform into a silk butterfly, lay from 800 to 1,000 eggs, and die.

One person can tend to 40,000 silk worms, but two persons can attend to 120,000, and raise 3,000 pounds of silk cocoons.

The silk worms eat night and day incessantly. They must not be crowded too closely together; the young worms must not be placed where the larger worms are eating, but must be kept separately.

Silk eggs must be wintered where they are to be fed and raised, and must be at their future home before the 1st of January preceding March. If shipped later in the season they are liable to be hatched in transit, and having no leaves, will die.

The silk worm rooms must be dry, provided with shutters or blinds, to be closed at night and during thunderstorms, especially when the worms are spinning their silk.

The eggs must be kept from mice, crickets, and ants, for they will feast on them.

In answer to many inquiries about the kind of mulberry leaf required, etc., I will say that any kind of mulberry tree will produce silk, but the white mulberry tree produces the finest silk. I have a limited supply of acclimated silk eggs, and shall in the future devote my attention principally to raising silk eggs in order to get a supply for your numerous readers.

In answer to the many letters which I have received asking what kind of a house is necessary, etc., I answer that any kind of a house, so it is dry and airy. They can be raised in rooms of all kinds and sizes—even in the cotton gin-houses on plantations, etc.

The attention of your readers is specially called to the urgent necessity of planting out young mulberry trees.

The Great Bell for St. Paul's.

Recently Messrs. Taylor, at Loughborough, have been testing the great bell which has been manufactured by that firm for St. Paul's Cathedral. Dr. Stainer, the organist of St. Paul's, speaks of it as follows in a letter recently published:

"'Big Ben' sinks into comparative insignificance by the side of 'Great Paul,' now lying comfortably, mouth upward, in the foundry of Mr. Taylor, of Loughborough. She (for I fear 'Great Paul,' as a bell, must, like all other bells, be considered feminine) will take her rank among the six or eight heaviest bells in Europe. At present her position cannot accurately be assigned, as she has not yet passed the scales; but it will probably lie between the great bell of Olmütz, weighing 17 tons 18 cwt., and that of Vienna (cast in 1711), weighing 17 tons 14 cwt. Three furnaces, one of which was specially built for the purpose, poured out more than 20 tons of molten metal into the gigantic mould of 'Great Paul,' and after writing off 43 cwt. as 'overplus' and 8 cwt. as 'waste,' this will leave 350 cwt. actually in the mould, or a weight of 17½ tons. This mass of metal, consisting of pure tin and copper in due proportions, was about eight and a half hours in course of melting; it was placed in the furnaces in the afternoon of Wednesday, the 23d of November, and was pronounced fit for use at half past ten at night. Four minutes after the rush of molten metal the mould was full, and 'Great Paul' came into existence in one of those deep 'pits' so mysterious to lookers-on. It was not until the evening of Tuesday, the 29th, that the heat had sufficiently abated to allow the men to hoist out of the pit the mould and bell in their 'case.' This cast iron 'case' had an all-important duty to perform: it had to resist the enormous strain of such a weight of metal when forcing itself impetuously into the mould; and so, in order to prevent a bursting asunder of the mould, it was made strong enough to bear a pressure of 200 tons. The upper portion of the case weighed 14 tons; the lower plate on which it rested, 7 tons. Including clamps and bolts, it is probable that the whole weight of this huge box was not far short of 25 tons. It may be easily imagined how great was the anxiety of all when the case was being taken to pieces, the clay mould broken up, and the mighty bell, bit by bit, exposed to view. The casting proved to be as smooth and delicate in surface and outline as if it had been a little 'treble' of 5 cwt. I have to-day, in conjunction with Mr. F. C. Penrose, been examining the bell and testing its tone. The 'skin' of the casting showed no flaw of any kind whatever; and when the tone was produced by swinging a heavy ball of iron against the sound bow a musical note boomed out which was impressive beyond description. The dimensions of the bell are as follow: Height, perpendicular (from lip to top of cannons), 8 feet 10 inches; diameter (from edge to edge of lip), 9 feet 6¾ inches; thickness (of middle of sound bow), 8¾ inches, or about one-thirteenth of the diameter. The note is E flat, the upper partials B flat, E flat and G being just audible with the sonorous ground tone. The general appearance of the bell is handsome, and all campanologists should, if able to get to Loughborough, take a walk round here, and also have an eye to the many valuable appliances which Mr. Taylor has brought together for the perfecting of his art. The cost of the bell and hoisting it into its place in the upper part of the northwest tower will be about £3,000, a portion of which has already been contributed. It has been decided to use the bell for the first time on Easter Sunday next, when I shall be surprised if Londoners do not realize the fact that 'Great Paul' is worthy alike of their ancient city and splendid cathedral."

Phytocollite, a New Mineral from Scranton, Pa.

This name has been given, says H. C. Lewis (Proc. Amer. Philos. Soc.), to a very curious, jelly-like mineral recently found near the bottom of a peat bog at Scranton, Pa. An excavation for a new court house had cut through a peat bog, below which was a deposit of glacial till. Near the bottom of the bog, in a carbonaceous mud, or "swamp muck," there occur irregular veins, of varying thickness and inclination, filled with a black, homogeneous, jelly-like substance, elastic to the touch. This substance becomes tougher on exposure to the air, and finally becomes as hard as coal. When thus dried, it is brittle, has a conchoidal fracture and brilliant luster, and closely resembles jet. It is nearly insoluble in alcohol and ether, but is entirely soluble in caustic potash, forming a deep reddish-brown solution, from whence it can be again precipitated on the addition of an acid. It has a specific gravity of 1·032, and burns with a bright flame. After having been dried at 212°, it has the following composition, according to the analysis of J. M. Stinson:

			or without ash,
C	28 989	C	30 971
H	5·172	H	5·526
N	2·456	O + N	63 503
O	56 983		
Ash	6·400		100·000
	100 000		

yielding the empirical formula $C_{10}H_{22}O_{16}$.

In its mode of occurrence and in general appearance, this substance closely resembles Dopplerite, but differs from that mineral in burning with flame and in its composition. Another jelly-like substance from a Swiss peat bog, differing both from Dopplerite and from the Scranton mineral, has been described by Diecke.

It is now proposed to group all these jelly-like minerals, produced by the decomposition of vegetable matter, under the one generic name of *Phytocollite* (Gr., *phuton, kolla,* "plant jelly") of which the three minerals now known would be varieties.

Special interest is attached to these substances, in that they illustrate the first step in the transformation of peat into coal.

Test for Gold.

There is a simple method for the detection of gold in quartz, pyrite, etc., which is not generally described in the mineralogical text books. It is an adaptation of the well known amalgamation process, and serves to detect very minute traces of gold.

Place the finely powdered and roasted mineral in a test tube, add water and a single drop of mercury; close the test tube with the thumb, and shake thoroughly and for some time. Decant the water, add more and decant repeatedly, thus washing the drop of mercury until it is perfectly clean. The drop of mercury contains any gold that may have been present. It is therefore placed in a small porcelain capsule and heated until the mercury is volatilized, and the residue of gold is left in the bottom of the capsule. This residue may be tested either by dissolving in aqua regia and obtaining the purple of Cassius with protochloride of tin, or by taking up with a fragment of moist filter paper, and then fusing to a globule on charcoal in the blowpipe flame.

It is being shown that gold is much more universally distributed than was formerly supposed. It has recently been found in Fulton and Saratoga counties, New York, where it occurs in pyrites. It has also been discovered in the gravel of Chester Creek, at Lenni, Delaware County, Pa. In one of the Virginia gold mines wonderful richness is reported, $160,000 worth of pure gold having been taken from a space of three square feet.

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A Sheep-Eating Parrot.

A singular bird has recently been added to the collection in the Zoological Gardens, London. This is none other than a carnivorous parrot, whose love of animal flesh manifests itself in a very decided predilection for mutton. There are two things which, to the naturalist, are remarkable in connection with this bird. First, it is, in respect of this flesh-eating propensity, an exception to the whole family of parrots, which are frugivorous, living on fruits, seeds, leaves, buds, and the like; and second, this carnivorous taste is not a natural but an acquired possession, the species of parrot in question having been till a few years since frugivorous, like others of its family.

This curious bird is the kea (*Nestor notabilis*) or mountain parrot, and comes from New Zealand. The general color of its plumage is green; its length from point of bill to extremity of tail is twenty-one inches; its bill is about two inches long, the upper mandible being curved and very strong. It inhabits the higher wooded glens and recesses of the mountainous districts of New Zealand, and, like the owl, is generally nocturnal in its habits. The kea was first made known to science in 1856.

In the time of Maori rule, the bird was as innocent and harmless in its habits, as respects its food, as any others of the parrot family; and it was not till the higher tracts of country were utilized by the early settlers as runs for sheep, that the kea was tempted to desert its fruit-eating habits and to join the destructive army of the carnivora.

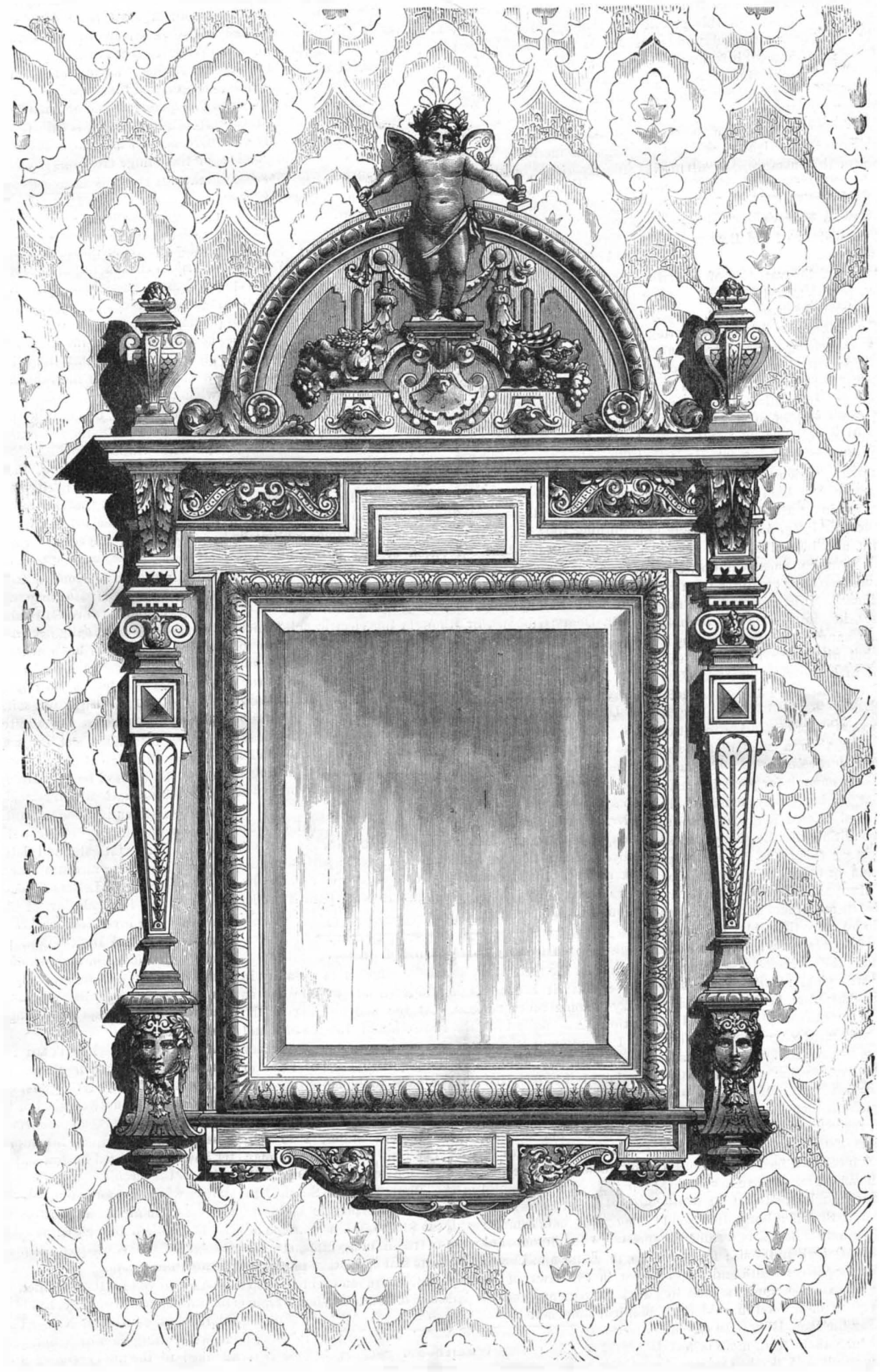
About 1868, it was noticed at the sheep-shearing season on the upland runs that many sheep were suffering from sores or scars, more or less recent, on the back, immediately in front of the hips. Curiously enough, it was observed that in all the animals so injured the wound was in precisely the same place in each—fairly above the kidneys. In some cases (says Mr. Potts, who has contributed an article to the *Zoologist* on the subject), the part affected had a hard dry scab, or merely a patch of wool stripped off; others showed a severe wound, in some instances so deep that the entrails protruded. The animals so injured were invariably those that were in the best condition; and many discussions ensued as to what could be the cause of this singular state of things. At last a shepherd gave it as his opinion that the injury was inflicted by a kind of parrot, rather a tame sort of bird, that was to be met with in the higher ranges; but the shepherd's opinion was only laughed at. Yet the shepherd, after all, was found to be right.

In connection with the stations on sheep-runs in New Zealand, there is a meat gallows, where the carcasses of sheep killed for food are kept; and it was observed by the shepherds that the keas were in the habit of visiting the gallows and breaking off bits of mutton-fat with their strong beaks. Soon afterward, one or more hands actually saw a parrot on the back of a sheep plucking and tearing the wool and flesh on a precisely similar spot to that where so many had been found to be fatally wounded.

There was no doubt about the keas being the offenders, and means were at once taken to have their numbers reduced. Since then, a mortal enmity has existed against them on the part of the shepherds; and justly so, as it is found that from three to five per cent of every flock is so wounded or killed. In some individual instances, the ratio of destruction has been much higher. On one station on the Matatapu, out of a flock of twenty Lincoln rams, nineteen were within one month killed by these parrots. On another run, a flock of three hundred and ten strong young wethers were, within a period of five months, so seriously injured by the keas, that at the end of that time only one hundred and five remained alive. In consequence of this destruction, men were engaged to kill the bird at a shilling a head; and these men, taking advantage of its nocturnal habits, now range the mountains at night, lighting fires to attract their game. In the daytime they rest and prepare the skins for sale. But the kea, with the cleverness and cunning of its tribe, has grown very shy and wary, and knows very well, when it sees a man carrying a gun, what he is likely to do with it.

Mr. Potts gives a striking account of the cruelty and rapacity of the keas in the prosecution of their horrible taste for sheep fat, the part especially liked by them being the fat that surrounds the kidneys. With this view they do not hesitate to tear open the animal's flesh till they arrive at these organs, after tearing out the fat of which, they leave the poor animal to linger on or die in excruciating agony. "Sheep," says Mr. Potts, "while being got out of snow drifts, are often mortally hurt by the attacks of keas; especially are the birds prone to molest those carrying double fleeces, as though they knew how firm a foothold they could maintain with their gripe. When one of these sheep, temporarily exhausted with its exertions in toiling through deep snow under the burden of two years' growth of wool, breaks off from the mob and leaves the track, desperately floundering into deeper snow wreaths, a flock of parrots, ever watchful as they hover round, soon perceive their opportunity for mischief; they alight close to the spot where the sheep, unconscious of approaching danger, stands gazing fixedly in a state of helpless stupidity; gradually hopping or moving toward the victim with some show of caution, one of the keas at last settles on the back of the sheep, which, terrified at the strange visitor that thus besets it, bounds away; the bird now rises only to alight again on the same place, and clutching into the wool with its sharp claws, retains its hold more firmly and tenaciously. In vain the tortured animal, in the direst agony, seeks to rid itself of its cruel persecutor, that boldly keeps its vantage; after running and struggling some distance, its efforts to escape become feebler; it is at length so hard pressed that in a few minutes it yields passively to the tearing and searching beak of the kea."

These repulsive flesh-devouring propensities may have been acquired through the bird being forced, in severe winters, to approach the stations in hopes of finding food, and there feeding on the flesh in the meat gallows, and thus gradually forming a carnivorous appetite of such strength, that its former frugivorous tastes are entirely destroyed, and flesh now forms its sole food. The kea in the Zoological Gardens was struck down while it was in the act of attacking a sheep; but the man did not succeed in capturing it till it had torn his clothes in many places and severely lacerated his hands. Its food consists mainly of mutton, raw; it does not care for cooked meat, but will take it if very hungry. Occasionally it will take beef, and is fond of pork. But its vegetarian tastes seem almost completely eradicated, for it will not touch bread, though it likes the seed of sow-thistle. It is altogether a remarkable and curious bird.



SUGGESTIONS IN DECORATIVE ART.—LOOKING GLASS FRAME IN OAK, DESIGNED AND EXECUTED BY FLACHAT AND COCHET, LYONS—[From the *Workshop*.]

Disease from Irrigation.

The question of irrigation in the West has been complicated by an alarming increase of malarial diseases in the irrigated districts of Southern California. It is said that where the

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desert lands of Fresno, Tulare, and Kern counties have been reclaimed by irrigation the progress of fever and ague, previously unknown there, has been rapid and general.

Various suggestions of remedies have been made, one idea being that if a system of thorough drainage should be combined with that for irrigation, it would mitigate the evil. Some benefit seems to be derived from having rooms used as dormitories at a considerable elevation from the ground, and huts raised on long poles have been tried, while one wealthy vine grower has built a three story dwelling. Others seek immunity by living in villages at a distance from their farms and the irrigating ditches; and perhaps this practice will become universal. As showing that the question is not a local one, confined to the counties named, it is mentioned that the same experiment was tried. with similar results, in the county of Yolo, a hundred miles north of San Francisco. A large ditch led the waters of a small stream across a number of farms, and in a few years ague became common, families began moving away, and, as irrigation was not indispensable to cultivation in this instance, the ditch was finally closed.

Pink Eye in Horses.

Dr. C. E. Page writes to the editor of the Boston *Medical and Surgical Journal* as follows:

This disease in horses is one of the varieties of catarrhal or influenza colds, so-called, prevalent in this climate among human beings, and springs from the same cause, namely, excessive, over frequent, or otherwise injudicious eating. The custom of working or exercising horses directly after eating; of feeding them directly after hard work, and before they are thoroughly rested; baiting at noon, when both these violations of a natural law are committed; these are the predisposing causes of pink eye, and of most diseases that afflict our horses. The symptoms denominated pink eye are not indicative of dangerous disease, unless feeding is kept up; but if it is, then pneumonia, which is merely an aggravation of the original disease, is very likely to result. Keep the horse quiet, dry, warm, and in a pure atmosphere. The nearer out-door air the better, and *stop his feed entirely* at the first symptom of disease, and he will speedily recover. As prevention is better than cure, horsemen will do well to heed the hint here given and keep their creatures from contracting this or any other ailment. It has been demonstrated in tens of thousands of cases, in family life, that *two meals* are not only ample for the hardest and most exhausting labors, physical or mental, but altogether best. The same thing has been fully proved in hundreds of instances with horses, and has never in a single instance failed, after a fair trial, to work the best results.

An hour's rest at noon is vastly more restoring to a tired animal, whether horse or man, than a meal of any sort, although the latter may prove more *stimulating*. The morning meal given, if possible, early enough for partial stomach digestion before the muscular and nervous systems are called into active play; the night meal offered long enough after work to insure a rested condition of the body; a diet liberal enough but *never excessive*; this is the law and gospel of hygienic diet for either man or beast. If it be objected that these conditions cannot always be fully met in this active work-a-day world, I reply, let us meet them as nearly as possible. We can, of course, do no more than this; but we can come nearer the mark on the two-meal system than on three. I will add, *in parenthesis*, that the nervous disorder commonly known as "pulling" will yield readily to this principle of treatment. It makes the puller healthy; he is better nourished and therefore less "nervous;" and he will do more roading, and without excitement or profuse sweating. He is not made less ambitious by reason of reduced muscular power, but by reason of better digestion and assimilation —more *nourishment* and less *stimulation*. Horse dealers or others, whose business or pleasure depends on the plump appearance of their animals, regardless of the size of their muscles, who must have a horse fat if he is not fleshy, for style, may have to take the chances and feed three times a day; but of this I am by no means sure. I have never tried to fatten my horses, for I long ago learned that fat is disease; but I have always found that if a horse does solid work enough he will be fairly plump if he has two sufficient meals. Muscle is the product of work and food; fat may be laid on by food alone. But for perfect health and immunity from disease, restriction of exercise must be met by restriction in diet. Horses require more food in cold than in warm weather, if performing the same labor. In case of a warm spell in winter I reduce their feed, more or less, according to circumstances, as surely as I do the amount of fuel consumed. I also adopt the same principle in my own diet. The result is, that neither my animals nor myself are ever for one moment sick.

Milk Diet in Bright's Disease.

Since we know not at present any drug that possesses therapeutic value to any marked extent in this terrible and fatal disease, and since it is daily making sad havoc among human beings, and principally among that class who, by reason of their valuable public labors, are particularly necessary to the welfare of the world; therefore, it becomes a medical question of paramount interest that we should discover some potent method of combating this very prevalent disease. Some years since Carel first called attention to the treatment of Bright's disease by the use of a milk diet, and since then Duncan, as well as many other prominent physicians, have written on this subject. We have ourselves seen some remarkable results follow this treatment, while Dr. S. Weir Mitchell, of our city, is now quite an enthusiast on this subject. This method of treating a formidable disease has received sufficient distinguished indorsement to recommend it seriously to our notice. We would, therefore, ask all physicians who read this article to try this method of treatment, and to furnish us with their experience, which we will publish. The milk is used thoroughly skimmed and entirely freed from butter. To procure the best results, it has been advised that the patient shall restrict himself absolutely to milk, and continue the treatment for a long time. If it disagrees with the stomach (as it will in some cases), Dr. Mitchell advises that the patient be put to bed, and the treatment commenced with tablespoonful doses, to which lime water is added, until the stomach tolerates the milk, when from eight to ten pints daily should be taken, and absolutely nothing else. The sanction of such a distinguished physician as Dr. Mitchell forces us to seriously consider the merits of this treatment, and we trust to receive the experience of all readers of this journal who may have cases of Bright's disease to treat.—*Medical and Surgical Reporter.*

Effects of Atmospheric Electricity.

At a recent meeting of the California Academy of Sciences, Mr. C. D. Gibbes, C.E., remarked that when surveying during our north winds, in the San Joaquin valley, the electrical disturbance was so great as to cause the needle of his compass to fly up against the glass and become useless during the first part of the day when in the field; but that if he took the same compass into a warm moist room, it again acted normally. Engineers in Santa Clara and Calaveras counties report the same action and dip of the magnetic needle during the prevalence of our dry northers.

Dr. Harkness said the northers affected the human skin. They caused an uneasiness, which results in dog fights, runaway horses, cross dispositions, pallid faces, etc. Dry atmosphere is a perfect non-conductor, but all moist plants and animals, as well as men, then become so many miniature lightning rods. The nerves are at such times continually irritated by a constant succession of tiny blows, like telegraphic ticks, against the nerve centers. They contract and produce a congestion of the organs; the blood becomes turbid, while kidneys, liver, and lungs all suffer.

Dr. Henry Gibbons, Sr., thought this electric action more subtle than from any apparent mechanical evolution of electricity from friction of the passing wind over the surface of the earth. He said all persons felt cold, for it drove the circulation from the surface to the interior of the body, as Dr. Harkness so beautifully described twenty years ago. Its effect on certain diseases has been marked. The death rate has been claimed to increase at such times. He had a patient whose eyes always blinked and snapped during a north wind, even in a warm, moist room entirely protected from direct contact with the wind.

Dr. Harkness said we were always surrounded by electricity, but did not perceive it until its equilibrium was destroyed, when it became manifest. In some parts of India silk underclothing is necessary to comfort, at certain altitudes, during dry north winds, and in other parts no relief is found in this clothing.

Insanity in the United States.

After all the recent talk about the increase of insanity in this country it is encouraging to learn that we are not so crazy as some other nations. At the late meeting of the National Association for the Protection of the Insane and the Prevention of Insanity it was shown our insane number about 63,000, or 1 to 777 of the population. The ratio in England is 1 to 350, part due, perhaps, to the more thorough separation of the insane from the general population. By sections the ratio is in this country: In New England, 1 to 588 Middle States, 1 to 600; Western States, 1 to 850; Southern States, 1 to 1,100. The ratio to which we may look forward in the future is, in the opinion of Dr. C. F. Dana: In New England, 1 to 500; West, 1 to 600; South, 1 to 800. In 1881 there were 74 State and 34 private asylums. The cost of maintaining them was $12,000,000 a year. The needs of the insane are want of room in asylums, separation of acute and chronic patients and epileptics, improvement in the laws of commitment, more amusement and work for patients, and a separation of State asylums from political influence.

Whalebone.

Aside from its oil-yielding properties, the whale also serves man's needs by furnishing him with whalebone. This was once an important article of commerce, but the supply and demand have for many years been diminishing. The fact is the whale does not live "in the North Sea" as much as he once did, and the decline in the New Bedford oil business is reflected in a measure in the whalebone industry. As the supply fell off substitutes for the article were discovered. Steel takes the place of whalebone in umbrella manufactures, and the latter now finds its chief uses in the making of whips and corsets.

The preliminary preparation of whalebone is about as follows: When the raw bone is received the hair is first cut from the slabs. These are then soaked in water until they become soft, after which all the gum which adheres to them is removed by scraping. They now go to a steam box, where a workman straightens them with a knife. After polishing they are ready to be worked up into various forms. There are certain places where it is probable that no known material answers so well as whalebone, and it is said that a fortune awaits the inventor who devises an efficient substitute for it. Experiments, looking to this end, have been made with rawhide.

Since the decadence of the hoop-skirt fever the price of whalebone has declined very materially, but the price was at its zenith in the last century. The Dutch formerly obtained $3,500 a ton for whalebone, but since 1763 it has never commanded such high figures. In 1818 the price was $450; in 1834, from $530 to $545; and in 1841 it ranged between $1,080 for Southern to $2,550 for Northern bone. We learn that in the upper jaw of the whale are thin, parallel laminæ, varying in size from three to twelve feet in length, and that these are what are known as "whalebone." The quality which commands the highest price is above six feet in length, and is called "size bone." It is said that the Greenland whale furnishes the best bone. From the mouth of these huge creatures from 2,000 to 3,000 pounds are often taken.

NEW INVENTIONS.

An improved side-bar vehicle has been patented by Mr. Lafayette A. Melburn, of Denver, Col. The invention consists in a certain improvement in the class of side-bar vehicles, more particularly in buggies, which are constructed upon what is commonly termed the "Brewster" pattern. The springs that support the bodies of such buggies require to be made very stiff in order to have the requisite strength, and, being also short, they lack that degree of elasticity necessary to render the vehicle comfortable to the occupant when passing over ordinary roads. In attempts heretofore made to remedy this defect various so-called improvements have been made in the form and arrangement of the springs, but without the desired success, since the result has been a noticeable, if not striking, inelegance of appearance, and considerable addition to the cost and complication of structure of the buggy, besides lessened efficiency in use. This inventor has devised an improvement in the form and arrangement of the springs which overcomes the defect of the Brewster.

An improved station indicator has been patented by Messrs. William H Hackney, of Laramie county, Wyoming Territory, and Edward G. Hudson, of Lincoln, Ill. The improvement consists in the peculiar means for reversing the movement of the ribbon when wound up, for which purpose the inventors place an intermediate shaft between the two shafts carrying the belt or ribbon. This intermediate shaft has a cog wheel adapted to engage with cog wheels on the ribbon shafts alternately by the lateral shifting of this intermediate wheel, the wheels on the ribbon shafts being set in different planes to permit this action, and the intermediate wheel being shifted by the longitudinal movement of the shaft, which is held by a latch entering one of two circumferential grooves in the shaft.

Mr. Benjamin Day, of West Hoboken, N. J., has patented an improved vertically and laterally adjustable frame for holding a printing medium—for instance, such as the printing film for which Letters Patent were issued to the same inventor on the 22d day of April, 1879, and numbered 214,493. The invention consists in a frame having the printing film attached thereto, and provided with clamping devices for holding it, and which are detachably hinged to longitudinally and transversely adjustable blocks held in clamps on a vertically adjustable frame surrounding the stone or block, so that the swinging film-holding frame will rest on the block or stone.

An improved switch board for use in connection with annunciator or burglar alarms has been patented by Mr. Lambert F. Fouts, of Greenfield, Iowa. The several doors and windows of a dwelling, hotel, or other structure, or any other desired points, are connected in a closed circuit with a battery, an alarm, and the improved switch board, the latter having a pivoted button and fixed post for each door or point in the circuit. When a "break" is made—as, for instance, when a door is opened—it may be located by moving one or more of said buttons until the restoration of the circuit through branch wires connected with the aforesaid posts and the consequent arrest of the alarm give the required indications.

An improved inkstand, which closes itself automatically, and can be opened readily, has been patented by Mr. Charles De Roberts, of Albion, Neb. The invention consists in an ink well resting on a base, and provided with a lid or cover attached to the upper end of a bell crank lever pivoted in the base, the lower end of which bell crank lever rests on one end of a lever pivoted to the under side of the base, and provided at the other end with a knob projecting above the top of the base, which knob is depressed by the hand when the cover is to be raised.

The First Chinese Ironclad.

The first ironclad battle-ship of the Chinese navy was lately launched by the Vulcan Company, at Stettin, at the mouth of the Oder. The ship is called the Ting-Yuen, or the Everlasting Peace, and is a turret corvette of the first rank, with compound armor of English steel and iron. Both turrets are armed with twelve-inch compound plates, and the four 30½ centimeter guns which they have can deliver broadsides simultaneously. On the deck, in addition, are eight other guns from Herr Krupp's foundry at Essen. The same company has a contract to build another ship of the same kind for China.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

THE SINGER M'F'G COMPANY'S CASE FACTORY,
SOUTH BEND, IND., Nov. 4, 1881.

H. W. Johns M'f'g Co., New York:

GENTLEMEN: Some of your Asbestos Roofing was used to cover our dry kilns during 1879, and at this date is in good order. The under side of roof is exposed to steam and acid generated in drying lumber, and a temperature of 250 deg. heat.

While the roof rafters and sheathing have cracked by the heat, your roofing shows no signs of damage. Tin roofs painted both sides used to last but a few months, while the ordinary gravel roofs are useless on our kilns.

Yours, very truly,
THE SINGER M'F'G CO., L. PINE, Supt.

For the Garden and Farm.—A great variety of Seeds and Implements. Send for catalogue. Address R. H. Allen & Co., P. O. Box 376, New York city.

To Stop Leaks in Boiler Tubes, use Quinn's Pat. Ferrules. Address S. M. Co., So. Newmarket, N. H.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 44.

Light and Fine Machinery and Tools to Order. Lathe catalogue for stamp. Edward O. Chase, Newark, N. J.

Chemist's Pocket Book.—For Chemical Manufacturers, Metallurgists, Dyers, Distillers, Brewers, Sugar Refiners, Photographers, etc. By Thomas Bayley. $2, mail free. E. & F. N. Spon, 446 Broome St., New York.

Patent Wanted.—I want to buy whole or part interest, or manufacture on royalty. Address H. C. Lyon, New York.

Manufacturers, Steam Boiler Owners, Towns and Cities desiring pure water, send for circular to the Newark Filtering Co., Newark, N. J.

Malleable and Gray Iron Castings to order, by Capital City Malleable Iron Co., Albany, N. Y.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Send for Pamphlet of Compilation of Tests of Turbine Water Wheels. Barber, Keiser & Co., Allentown, Pa.

List of Machinists in United States and Canada, just compiled; price $10. A. C. Farley & Co., Philadelphia.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited. Erie, Pa.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Cope & Maxwell M'f'g Co.'s Pump adv., page 45.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 45.

Safety Boilers. See Harrison Boiler Works adv., p. 44.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 45.

Improved Skinner Portable Engines. Erie, Pa.

Clark & Heald Machine Co. See adv., p. 62.

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 61.

Draughtsman's Sensitive Paper. T. H. McCollin, Phila., Pa.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 60.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 62.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phila. P.

Skinner's Chuck. Universal, and Eccentric. See p. 61.

See Bentel, Margedant & Co.'s adv., page 76.

Silica Paints (not mixed); all shades. 40 Bleecker St., N.Y.

Machine Diamonds. J. Dickinson, 64 Nassau St., N.Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Telegraph, Telephone, Elec. Light Supplies. See p. 76.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Eagle Anvils, 10 cents per pound. Fully warranted.

Peerless Colors for Mortar. French, Richards & Co. 410 Callowhill St., Philadelphia, Pa.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Gould & Eberhardt's Machinists' Tools. See adv., p. 77.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 76.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 76.

Centrifugal Pumps, 100 to 35,000 gals. per min. See p. 77.

The Medart Pat. Wrought Rim Pulley. See adv., p. 76.

Our goods speak for themselves, and a trial will convince the most skeptical of their superiority over all others. Lehigh Valley Emery Wheel Co., Lehighton, Pa.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Combined Concentric and Eccentric Universal and Independent Jaw Chucks. The Pratt & Whitney Co., Hartford, Conn.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 77.

Portable Power Drills. See Stow Shaft adv., p. 76.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

The Sweetland Chuck. See illus. adv., p. 78.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 631 Arch, Phil.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 77. Totten & Co., Pittsburg.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N.J.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

TO OUR CORRESPONDENTS.—The destruction of our old offices by fire January 31, 1882, caused the loss of a considerable number of inquiries from correspondents and of our replies thereto, which we had in hand for publication. Those of our friends who find their inquiries neglected will know from the above the reason why; and they will oblige the editor by repeating their inquiries without delay.

(1) J. B. L. asks: What is the explosive matter used in caps for toy pistols? Have tried chlorate potash and flour sulph.; chlorate 2 grains to sulph., 1 grain. Will not work. I have also tried charcoal and chlorate, but without success, though the preparation explodes in a mortar. A. Usually a mixture of gunpowder and potassium chlorate. See Fulminating Compounds, page 48, volume xlv.

(2) F. F. writes: What can I put in sperm oil to prevent its gumming? A friend suggests a solution of soda. How could I mix it? Is there anything better that I could try, as I should think that the solution of soda would rust the machinery? A. Alkali will not accomplish what you require. The oil is usually treated by exposing it to contact with lead shavings for a few days. See "Lubricants," SUPPLEMENT No. 316. 2. Is sulphur good to cool hot bearings; and why? or what is the nature of sulphur, that it reduces the friction? A. No; when mixed with a heavy fluid vehicle it can sometimes be used advantageously on heavy bearings to relieve friction.

(3) B. C. B. writes: Is there any acid or compound that will dissolve or cut out the lime deposit in the waterback of a stove where hard water is used? A. We know of nothing that could be safely applied in the way proposed. Any solvent that would take out the lime would be apt to corrode the iron.

(4) F. H. L. asks what it is that is used on paper and silk that when it is exposed to heat or dampness will change from blue to pink—being blue when exposed to heat or dryness, and pink when exposed to cold or moisture. A. The liquid you refer to is very probably a dilute aqueous solution of pure cobalt chloride.

(5) J. B. G. asks: By what means can I blue the barrel of a gun or make it look like blue steel? I think chloride of iron and gallic acid are two of the compounds used, but I wish to be certain of it. A. Try the following: Scour the steel with a small quantity of a strong aqueous solution of soda, rinse in water, warm, and brush over with a solution of a quarter of an ounce chloride of iron dissolved in five ounces of water, and let it dry; then apply in the same manner a solution of one-fifth of an ounce pyrogallic acid in one ounce water, dry, and brush. Does not wear well without lacquering. The blue oxide is sometimes imitated by using a thin alcoholic shellac varnish colored with aniline blue or Prussian blue.

(6) R. S. M. writes: The countershaft of my planer and matcher broke square off, just at the edge of the journal. It is attached to frame, has three bearings, and ran smooth and had no jar. It just came in two, and stopped while running smooth. A. The probability is that the journal bearings were not in line, and the shaft was sprung at every revolution, until a break occurred, like bending a wire many times across the finger.

[OFFICIAL.]

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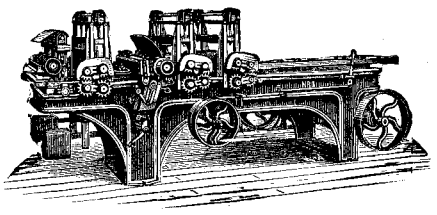

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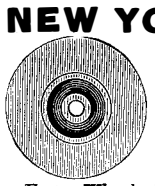

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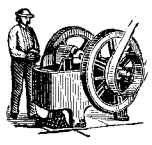

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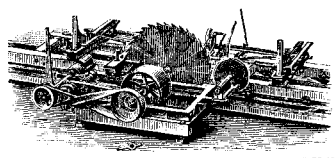

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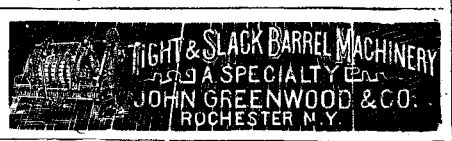

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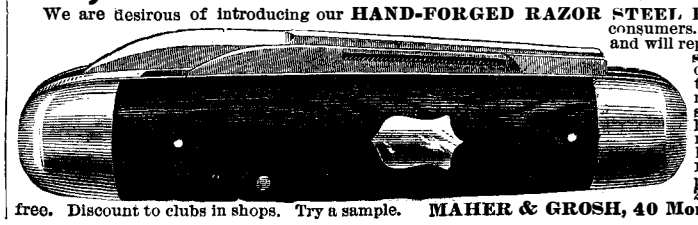

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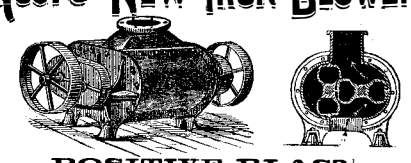

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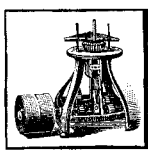

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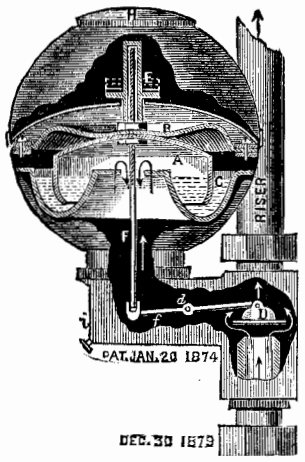

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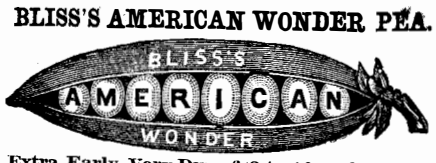

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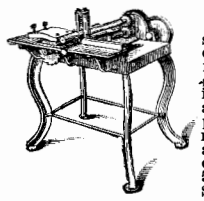

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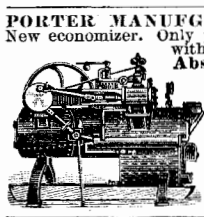

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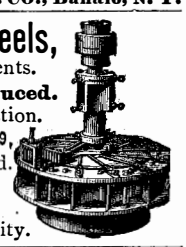

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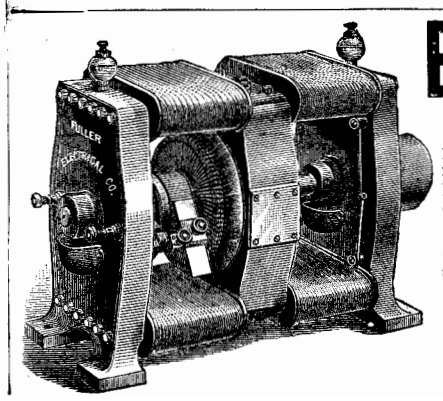

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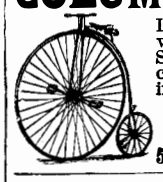

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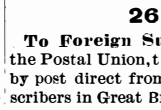

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